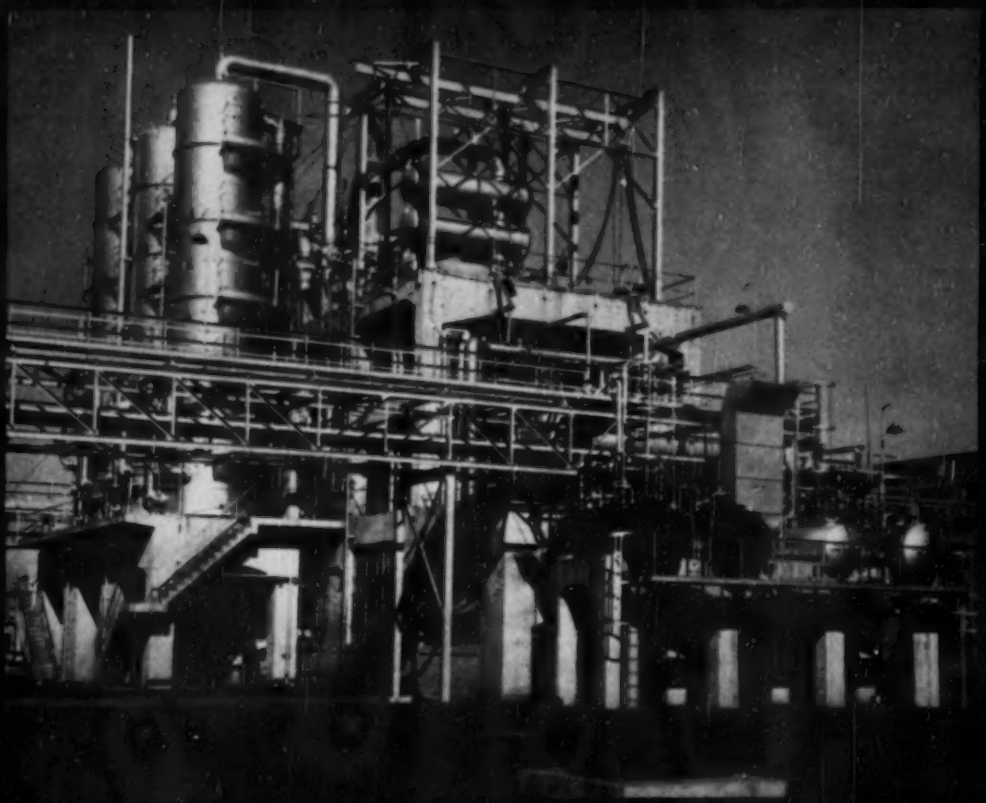
APRIL
1950

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING



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WITH CHEMICAL & METALLURGICAL ENGINEERING

APRIL 1950 VOL. 57 NO. 4

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HOW TO USE READER SERVICE—PAGE 5

HOW TO USE THIS . . .

Reader Service

A NEW SECTION

Purpose of this new Reader Service Section is to make it easy for you to get more information from manufacturers. It applies to any advertisement and to the three editorial departments: Equipment News, New Products and Materials, Manufacturers' Publications. There is no charge or obligation.

WHAT IT CONSISTS OF

There are four parts. On the narrow pages following this one are (1) an index of products advertised in this issue, (2) an index of advertisers, (3) indexes of editorial items in this month's Equipment News, New Products, and Manufacturers' Publications departments. And (4) on the right are two postcards, one for you and a spare for a friend, on which to check the advertisements or editorial items that interest you. (Also on the heavy card insert is a list of articles published in this magazine and available in reprint form. They are listed there as a convenience; but their purchase must be by separate order to the editorial department.)

WHAT THE NUMBERS MEAN

Advertisements:—There is a number on the postcard for each advertisement in this issue. The numerals give its page number; the letters L, R, T, B (left, right, top, bottom) locate the ad on the page and so distinguish it from other ads on the same page.

Editorial Items: Numerals are page numbers; the ABC's distinguish among items where more than one is on a page. There is a number on the postcard for each item in the three editorial departments: Equipment News, New Products and Materials, Manufacturers' Publications.

HOW IT WORKS

Circle as many numbers as you like on one of the two postcards. Write your name and address on the other side. Mail card to us, and we tell each manufacturer what you are interested in.

PRODUCTS ADVERTISED

To get more information about any of these, circle its number on one of the two postcards on the right. Use numbers listed under "Advertisements." Circle as many as you like, then fill in other side and mail to us. Numerals give the ad's page number; L,R,T,B (left, right, top, bottom) locate it on the page, distinguish it from other ads on the same page.

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This is an index to three editorial departments. Numbers are page numbers; abc's distinguish between items where more than one is on a page. To get more information about new equipment or new products—or to get a free copy of manufacturer's publication—circle the item's number on the post card on your right. Use the numbers listed under "Editorial Items." Circle as many as you like.

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REPRINTS

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PACIFIC PROCESS INDUSTRIES **PPI** *A Section of Chemical Engineering*
APRIL 1950 *Vol. 57, No. 4*

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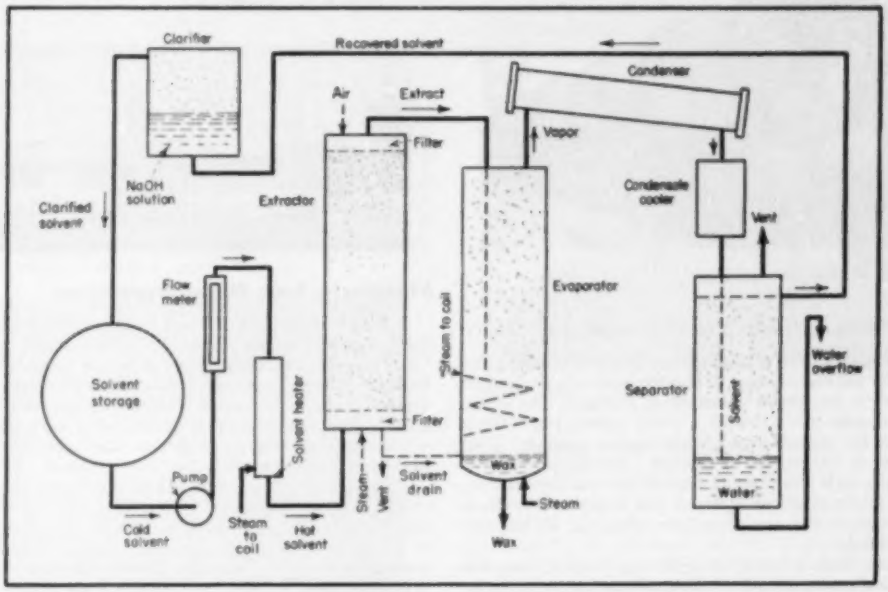


Wax from Fir Bark

PPI reported last October that interests from Americus, Ga., had leased, for the purpose of manufacturing molasses from wood waste, the government-owned war plant at Springfield, Ore., that never successfully served its purpose of producing industrial alcohol. The lessee, Oregon Wood Chemical Co., has now disclosed plans also to extract wax from fir bark in a portion of the plant. It would be the first commercial production of such wax. A company official says that an outlet in California has been found for all the production. The yield is estimated at the rate of about 120 lb. per ton of oven-dry bark. Initial output of wax is estimated at two tons per day.

Several months ago the company made some experimental runs in the equipment which the Oregon Forest Products Laboratory, Corvallis, Ore., has been using. The process, developed at the laboratory under Dr. E. F. Kurth, head of the chemical utilization section, has been investigated there since 1947. Equipment has not been available with which to estimate the cost of producing the wax commercially. Ground bark, in which the wax occurs, is extracted batch-wise with hot benzene, hexane or chlorinated hydrocarbons for a period of about three hours. The extract is then pumped to an evaporation chamber where the solvent is distilled off with steam, leaving the wax in the bottom of the evaporator. Oregon Wood Chemical Co. plans to use benzene.

The laboratory has been distributing samples of the wax, as well as other extractives, to determine its market potentialities. It is harder than beeswax but not as hard as carnauba. About 11 million lb. of beeswax is used annually in the U. S., of which around 60 percent is imported. Annual consumption of carnauba wax, imported from Brazil, is between 12 and 15 million lb.

The yield of wax extracted with benzene or chlorinated hydrocarbons averages, on the basis of oven-dried bark, about 7.5 weight percent. If hexane is used, the yield is around 5 percent. The hexane-extracted product melts at 140-145 deg. F. and is composed of lignoceric acid, ferulic acid and lignoceryl alcohol, largely combined in the form of esters. The wax extracted with benzene has about the same melting point but has a more complex chemical composition.

Potential availability of the wax far exceeds the annual consumption of beeswax and carnauba. In Washington and Oregon, the production of sawlog bark alone runs about 1.5 million tons annually. On the basis of a 5 percent wax recovery, this would yield 150 million lb. of wax.

Work at the Forest Products Laboratory indicates that both wax and tannin can be advantageously combined in an integral operation on the bark, although Oregon Wood Chemical Co. has not disclosed any plans to produce tannin.

Bechtel Opens Branch at Tulsa

Bechtel Corp., San Francisco, has opened an office at Tulsa, Okla., as its Midcontinent headquarters. The West Coast engineering and industrial construction firm decided

upon Tulsa as the base for expanding operations in the Midcontinent territory in connection with the petroleum and chemical industries there. In charge of the Tulsa office is George Gibson, formerly with Bechtel in New York City. Gibson was an executive in the Materials Division of the Petroleum Administration for War at Washington during the last conflict.

Largest Haydite kiln.

Smithwick Shale Plant Completed

If construction schedules were met last month, a new plant for the manufacture of Haydite light-weight aggregate from shale has begun operating at Portland. An equipment feature is the use of a rotary cooler, not hitherto used in the manufacture of this type of product. Daily capacity is 300 cu. yd. of product. Smithwick Concrete Products built the plant to furnish material for the company's block plants at Portland and Eugene, Ore. Shale is brought to the new plant from Vernonia, 40 mi. west of Portland.

Raw shale is heated at 2,200 deg. F. in a rotary kiln 8 ft. in diameter by 100 ft. long, the largest so far in the expanded shale industry, where softening of the material and a large expansion in its volume occurs as gases within the shale expand. The finished cellular product has a density of only about 44 lb. per cu. ft.

The rotary cooler for the material from the kiln has a diameter of 25.5 ft. and is 50 ft. long. In order to secure economy in the use of fuel oil (4,400 gal. per day is used) the air used for combustion is passed initially through the cooler, where it is preheated to 650 deg. F. Cooling of the product and preheating of the air are thus accomplished together.

L. A. Chemical Making Ceramic Colors

About a year ago Los Angeles Chemical Co., previously jobbers for a small range of ceramic colors manufactured in the East, decided to establish a division to manufacture these products at its plant near Los Angeles. A pilot plant program was set up under the direction of C. W. Crooks, veteran British color and glaze chemist. As a result of the development work the company is now in commercial production, and regards itself as the first firm in the West to manufacture a complete range of ceramic colors for the pottery and tile industry of the region.

In production at the plant at South Gate, near Los Angeles, is a line of underglaze stains, glaze stains, engobe stains and body stains. Plans for future include the manufacture of over-glaze colors and glaze frits.

Basic raw materials, purchased from various localities, are the oxides of cobalt, chromium, iron, copper, manganese, nickel and vanadium, blended with such materials as oxides of zinc, titanium and tin, and alumina, silica and borax. Following the batch mixing, either in the dry state or in ball mills with water, the mixture is screened, dried and pulverized, then calcined in fireclay crucibles. The calcined product is ground with water in ball mills, washed with hot water, dried, pulverized and tested for color accuracy. Maintenance of uniformity between batches is the crux of the operation.

Stauffer's New Plant Operating

Despite delays in construction caused by bad weather, the new superphosphate plant at Tacoma which Stauffer Chemical Co. announced last fall is now in production. Built by Stauffer's own engineering staff, the plant has a nominal capacity of around 35,000 tons per year. The main building is a steel frame structure with sides and roof of corrugated aluminum. Sulphuric acid is stored in two steel tanks having a combined capacity of about 2,500 tons.

Phosphate rock is mined and ground by San Francisco Chemical Co. (no corporate connection with Stauffer) at Stauffer-owned properties at Sage, Wyo., and is brought by rail to Tacoma in covered hopper cars. Stauffer buys the acid produced by American Smelting & Refining Co.'s new sulphuric acid plant at Tacoma. Any acid in excess of that required to manufacture superphosphate is made available to other consumers of acid in the area. Stauffer ships the superphosphate either in bulk or in 100-lb. bags. Wilson & George Meyer & Co. is exclusive distributor.

John B Wheeler, Jr., who was acid plant supervisor and superphosphate supervisor at Stauffer's plant at Richmond, Calif., is superintendent at Tacoma. Plant engineer and chemist is George Reid, who was also stationed at Richmond. Office manager is David B. Gault, formerly at the company's plant at Portland, which manufactures aluminum sulphate solutions and insecticides. General supervision of all operations is from the company's main office at San Francisco. Direct control is exercised by Dan J. Keating, manager of the company's Pacific Northwest division.

Portland Drives for More Industry

The Port of Portland Commission, a state agency organized under Oregon state law to promote the industrial development of Portland, has begun a campaign to populate its "Swan Island" with electrochemical and other industries.

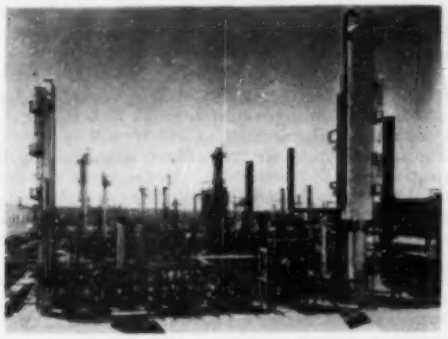
Two factors are behind the commission's drive. One is that the government is relinquishing its leasehold on the 250-acre tract (actually a small peninsula on the Willamette river, not an island) owned by the commission. The property is on deep water and therefore attractive from the standpoint of water movements.

The second factor is that large blocks of additional electric power will become available in 1953-1954 with the completion of generation equipment at Hungry Horse dam (western Montana) and McNary dam on the Columbia.

The commission is working with the Bonneville Power Administration, and has retained Ivan Bloch, industrial consultant in Portland, to contact major industrial groups. The commission also owns a tract of about 400 acres on the St. Johns peninsula, just outside the city limits.

Washington Lab Uses Solvent Process

Washington Laboratories, one of the major producers of vitamin A, has installed at Seattle a new "closed" process of extracting vitamins and amino acids by processing livers of halibut and other fish. Under the old process the livers were digested and broken down into a mixture of solid and liquid materials. In the subsequent centrifugal separation, vitamin A recovery was satisfactory, but there was a loss of other valuable components. A new solvent extraction process has been installed which permits recovery of these extractives.



Born 1913, reborn 1950.

Bakersfield Is Rejuvenated

Standard Oil Co. of California's completely modernized refinery at Bakersfield, Calif., is now pouring out motor gasoline, distillates and residual fuels and asphalts for consumers in the San Joaquin Valley. This new plant bears no resemblance to the old refinery, which was completed in 1913 around 15 shell stills as the nucleus. There were no cracking facilities.

As rebuilt, the refinery now consists basically of a single stage atmospheric tube still, a two-coil thermal cracking unit, a Unisol gasoline treater and acid treating and rerunning facilities for finishing cracked gasoline. Refinery crude capacity has been raised about 50 percent to the new level of 20,000 bbl. per day. In addition to the above facilities, a new administration and laboratory building, shops and maintenance facilities were installed.

Standard rebuilt the plant in order to increase its throughput and, by installing the cracking unit, to obtain higher per barrel yields of gasolines and distillates and reduce the yield of residual fuel oil, which has recently been in considerable excess in California markets.

In the new scheme, San Joaquin crudes go through the tube still where light products are removed. Residual crude then goes to the thermal cracker, where it is fed into the cracker fractioning tower to be split into a heavy fraction and a gas oil distillate. The heavy stock goes into two heavy oil heaters, and the gas oil into a light oil heater to be converted into cracked naphtha distillate and cracked residual.

The naphtha stream is rectified butane-free and then fed to the Unisol treater, where it is freed of mercaptans by contact with caustic methanol solution. Butane from the cracker is recovered and purified in a gas recovery section. The Unisol treated naphtha is split into a light and a heavy stream. The heavy product gets the conventional acid treat and rerun before joining the light cut and the straight run gasoline from the tube still to make refinery gasoline.

Damsite better.

New Market for Asphalt

In the Baldwin Hills, near Los Angeles, the Los Angeles Bureau of Water and Power is nearing completion of a 300 million gal. earthen water reservoir, covering 18 acres, that is lined with petroleum asphalt. Experimental work performed before use of the material was decided upon indicates that the application of asphalt in such construction should practically eliminate the seepage loss of water. If the performance of the Baldwin Hills project bears out this view, it may lead to a wider use of the heavy ends of petroleum, which have recently posed a serious disposal problem to West Coast refiners.

Water conservation agencies and representatives of private companies concerned with water reservoirs, dams and canals have expressed interest in the project and have visited the operation at Los Angeles.

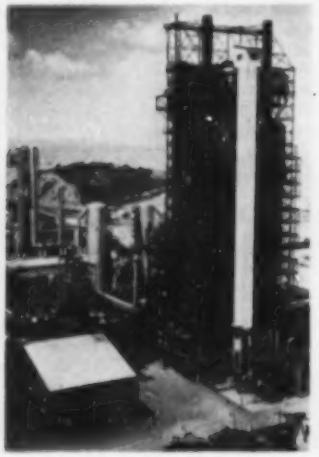
The site of the reservoir consists of sand, sandy loam and silt. It was necessary to find a relatively cheap and effective lining to minimize seepage losses in this type of earth.

General Petroleum Corp., a large producer of asphalt with a refinery in the vicinity, made a number of tests with different types of asphaltic materials and is furnishing asphalt for the undertaking. As a result of the investigations decision was reached to apply asphalt on the inside banks and floors which would penetrate the soil and form a crust, the purpose being to secure the maximum penetration of asphalts of light grade into the soil surface. Several applications of MC and SC grades were made. After these, 200-300, and in some areas, 85-100 grades were applied. In some localities, a heavy grade of 40-50 asphaltic material was applied at the rate of 0.3 gal. per sq. yd. and cotton fabric placed over the application and sprayed with the same material at the same rate.

The final step will be the covering of the soil thus prepared with 10 ft. of selected compact earth and the surfacing of this earth with 3 in. of asphalt concrete.

Any water that seeps through the compact earth and concrete will be collected in a cement gravel drain on the waterproof membrane.

It is estimated that a total of 1,300 tons of asphalt will be used by the time the project is finished.



TCC cracker (right) becoming Houdriflow to handle heavier oils.

Standard Changes Thermofor To Houdriflow

At its Richmond, Calif., refinery, Standard Oil Co. of California is taking two steps to reduce the production of heavy fuel oil and increase the yield of distillate fuels. Standard, like other western refiners, is having to cut its output of heavy fuel because of the change of western railroads from heavy fuel to diesel, the decrease in shipping traffic on the Pacific Coast, and the growing use of natural gas as an industrial fuel.

As one move, Standard is converting its existing Thermofor catalytic cracking unit to a cracker of the Houdriflow type. As a result of the alterations the coke burning capacity of the unit will be increased. After the conversion is completed, 500 tons per hr. of catalyst can be circulated, as compared with the present 150 tons. The change will not substantially increase the capacity of the unit but will permit the unit to handle appreciably heavier oils than it can now process, and convert these oils into gasoline and distillate fuels, both of which are wanted.

The second thing the company is doing is installing a vacuum flash tower having a diameter of 26 ft. and a capacity to handle 50,000 bbl. per day of charge stock. This installation will enable the refinery to obtain a substantial yield of distillate oils from heavy residual stocks, thereby reducing the output of such stocks.

Commodity Surveys Being Made

A series of new commodity studies dealing with the Pacific Northwest has been laid out by Raw Materials Survey, non-profit organization at Portland, Ore., and is expected to be completed this year. One of these is a survey of markets for refractory materials and glass containers, a project to be carried out with the assistance of the Oregon State School of Engineering.

Another enterprise is a study of the production of lime and limestone. This will include a report on all the principal sources of materials within reasonable economic distance of the lower Columbia river, a list of the producers now serving the area, with data on prices, freight rates, physical and chemical analyses, as well as a market analysis for both lime and limestone products.

A third subject will be the listing of present sources of industrial salt, a survey of all literature available concerning salt occurrences in the Pacific Northwest, and a discussion of possible new sources.

Considerable attention is being directed to possibilities of increasing port traffic in the lower Columbia river area. Revisions are being made in an earlier publication, "Possible New Industries for the Lower Columbia River Area Based on Imported or Off-Shore Raw Materials" and this work should be available in April.

New Canadian Gypsum Source

Columbia Gypsum Products, Inc., offices at Windermere, B. C. and Spokane, has opened a new quarry near Windermere and is offering gypsum in carload lots. Exploratory work begun in 1948 has indicated large reserves of the mineral analyzing 75 to 90 percent gypsum. Reserves are just over the Canadian border north of Spokane.

J. M. Cummings, consulting geologist for the company, says that "In the vicinity of Windermere, we have traced the gypsum deposit for a length of 6 mi., with a surface width of from 300 to 1,000 ft. Of this, over a third appears to be economically quarryable. In the vicinity of Canal Flats, 30 mi. to the south, we have control of another deposit of comparable size and quality." He says that run-of-mine production from the present quarry will probably range between 82 and 84 percent gypsum.

The company has just completed a crushing and grinding plant at Spokane. The Portland office of the Department of Commerce says there is no tariff on the importation of crude gypsum.

Utah-Idaho to Recover Beet Waste

Utah-Idaho Sugar Co., large sugar beet refiner having a number of refineries in the West, has begun construction of a plant at its refinery at Idaho Falls, Idaho, to concentrate Steffen waste for shipment to the San Jose, Calif., monosodium glutamate plant of International Minerals & Chemical Corp. Completion of the approximately $250,000 project, the first such installation for Utah-Idaho Sugar Co., is expected about August 1. Three or four tank cars of the concentrate (65 percent solids) will probably be dispatched to San Jose each week.

The company's own technical staff designed the plant, which will be of a type conventional for this service.

New Owner Opens Feldspar Mill

Campo Milling Corp., a newly organized company, has bought from American Radiator & Standard Sanitary Co. the feldspar quarry and mill at Campo, San Diego County, Calif., and is placing the mill in operation. It had been idle during the last eight years because of high operating costs. Current grinding and crushing is for the production of feldspar for industrial and agricultural uses.

Campo Milling Corp., of which Thomas J. Williams

is president, has placed the mill under management of B. F. Darnell as mining and milling superintendent. It is planned to install a froth flotation plant for the separation of mica, feldspar and silica under a process which Armour & Co. has developed. Wet ground mica will be produced for tires, wallpaper, paints and insulations.

Research Conference for Portland

Pacific Northwest Research Conference is the tentative name of a gathering being planned for Portland later this year, perhaps September 18. The objective is to alert small and medium-sized companies to the value of research and to acquaint them with research centers in the area. Sparking the idea of the conference are the Raw Materials Survey, Inc., of Portland, and the Chamber of Commerce. Subsequent annual gatherings may be held in Spokane, Tacoma and Seattle.

Plans for the 1950 conference include discussions on "Translating Results of Industrial Research Into Production," "Does Industrial Research Pay," and "Definition of the Fields of Industrial Research." A considerable portion of the program will be devoted to a review of existing research facilities in the Pacific Northwest, a session which probably will be headed by George Gleeson, dean of the engineering school, Oregon State College.

New Hardboard in Production

After more than a year of development and plant construction, Forest Fiber Products Co. has put into operation at Forest Grove, Ore., its plant for the manufacture of a new weather-resistant hardboard from Douglas fir wastes. The firm, a subsidiary of Stimson Lumber Co., performed its own research and development work and designed much of the equipment. The firm has not yet decided on whether it will license the process to other manufacturers. Applications of the product include the manufacture of counter tops, walls for showers, drain boards, sidings and other exterior products.

A phenolic-type resin is employed. The fir is pulped, combined intimately with the resin, matted in a specially built fourdrinier machine and compressed. After the board is formed it is given an additional plastic surface treatment to intensify its waterproof qualities.

Newcomer in Newsprint

Edmonton Pulp & Paper Mills, Ltd., a new firm chartered in Alberta, B. C., plans to build a newsprint mill near Edmonton, Alta., with an annual capacity of 70,000 tons. Production should begin early in 1951. Negotiations have been completed with the Canadian government for stumpage rights. Investment involved is around $10 million.

Officers include Robert O. Sweezey, Montreal, president; L. Glenn Fassett, Minneapolis, vice president; William M. Owens, San Francisco, chairman of the board.

Plywood Cooperative to Start

The ninth cooperatively owned and operated plywood firm in the Pacific Northwest is scheduled to go into production in April at Portland when a new cooperative, Multnomah Plywood Co., completes the unfinished plant purchased last year from Portland Plywood Co. At the time of the $1 million deal the plant was about 85 percent completed.

Capacity of the plant is 3 million feet per month, with provision of expansion to 4.5 million by the addition of another dryer. Modern processing methods will be used with conventional equipment. At the start, production will be confined to interior plywood.

Officials are: F. A. Johnson, president; C. A. Smith, vice president and W. A. Bryson, secretary-treasurer.

The cooperative is financed through sales of 150 shares of stock to 150 plywood workers at $2,500 a share. Another 150 shares will be offered later under SEC supervision, giving each shareholder the right to buy an additional share under a wage deduction plan. No holder may acquire more than two shares.

Inspecting welds: R. Rhoades, Bechtel Corp.; H. F. Walker and N. L. Barron, Pacific Gas & Electric Co.

"Super-Inch" Ready in Year

Early next January, industries in the San Francisco Bay region should be receiving natural gas from west Texas and northern New Mexico via the 2,100 mi., $150 million pipeline being laid across half the continent by Pacific Gas & Electric Co. and El Paso Natural Gas Co. Pacific Gas will receive at the outset, 150 million ft. per day. This will be boosted by Jan. 1, 1952, to 250 million ft., with an ultimate daily capacity of 400 million. These are estimates based on status of construction last month.

Maximum diameter of the line, 34 in., is the largest yet used for natural gas transmission. The gas, after being gathered in Texas and New Mexico, will enter Pacific Gas & Electric Co.'s main near Topock, Calif., then move westward past Bakersfield and northward ultimately to Milpitas, the distribution point south of San Francisco bay.

Power the Bottleneck Now

Portland is seeking to line up more power-users now to go into operation a few years hence, but at present the city and other industrial communities of the Pacific Northwest are feeling the power pinch. Several electrochemical plants are not obtaining the power they would like in order to expand production, and a few other proposed projects have been delayed for similar reasons.

The largest amount of new power on the way is that to be obtained at McNary dam, where scheduled peak capacity is about 1 million kw. There, production should begin in 1954, although it will be 1957 before all equipment is fully installed. The power capacity obtainable from

Hungry Horse dam will be 300,000 kw, some time in 1952. Bonneville is at capacity now.

Power consumption in the Northwest has ballooned from 7 billion kwh. 10 years ago to 22 billion last year. Bonneville Power Administration foresees a load of almost 50 billion kwh. in eight years.

Fluor Extends Engineering Offices

At its headquarters at Los Angeles, Fluor Corp. is erecting a new precast concrete engineering building as part of an expansion program. The air-conditioned structure is designed to contain 25 offices for engineers, five drafting rooms to accommodate 150 draftsmen, three blueprint machines and a conference room.

Wilshire Now Traps Hydrogen Sulphide

Wilshire Oil Co. has completed the installation of Girbotol absorption equipment at its Norwalk refinery near Los Angeles to strip the refinery gases of hydrogen sulphide, which is converted into sulphuric acid at the plant of General Chemical Co. in the same vicinity.

In an operation similar to that of Union Oil Co., described last month, the gases are passed through a solution of diethanol amine. The solution is then stripped of the hydrogen sulphide, which is thereafter re-absorbed in monoethanol amine and carried by tank truck in this solvent to General Chemical Co.

Potlatch Starts on New Mill

Construction has begun on the new 230 ton per day sulphate pulp and paper mill at Lewiston, Idaho, that Potlatch Forests, Inc., expects to complete by next January. To cost approximately $2 million, the mill will process logs from northern central Idaho and in addition all the wood waste from the company's nearby sawmill and veneer plant. The general contract was awarded to W. J. Park & Sons, Yakima, Wash.

Union Oil Discloses New Process

For some time Union Oil Co. of California has been developing on a large pilot plant scale at its refinery at Wilmington a process designed economically and effectively to refine low-gravity crudes of high sulphur content. A typical such product is 15 API Santa Maria crude containing 5 weight percent sulphur. Although continuing various phases of the work that are expected to bring about further refinements, the company has reached the point where tentative designs for a commercial unit have been made, and such an installation may be built.

Company chemists and engineers believe that although other approaches to desulphurization, such as extracting sulphur compounds rather than destroying them by hydrogenation, may be economically feasible for high-gravity oils of low sulphur content, they do not seem attractive when applied to low-gravity crudes with large quantities of sulphur compounds.

Union's hydrodesulphurization process, as it is called, may be applied in several alternate forms. An attractive approach in the case of Santa Maria crude consists of coking of this stock in conventional equipment and then desulphurizing the full-range coker distillate over a specially developed cobalt molybdate-type catalyst having high activity for the hydrogenation of organic sulphur, nitrogen and oxygen compounds to hydrocarbons, hydrogen sulphide, ammonia and water. The catalyst is designed to be particularly resistant to deactivation by catalytic coke accumulation, thereby permitting long on-stream operation with little variation in quality of the treated products during the run. Regeneration is performed by oxidation of the coke with a diluted air stream.

Hydrodesulphurization of the coker distillate is accomplished at reaction pressures and temperatures ranging up to 1,500 psi. and up to 950 deg. F. Liquid feed rates and hydrogen charge rates normally range from two to six volumes of oil per volume of catalyst per hour and 2,000 to 6,000 cu. ft. of hydrogen per bbl. of feed, respectively.

Following are results of an experimental hydrodesulphurization run of 262 hr. on Santa Maria Valley coker distillate under reactor conditions of 770 deg. F. and 1,100 psi; two volumes of oil per volume of catalyst per hour; and 4,000 cu. ft. of hydrogen per bbl. of feed.

	Raw Distillate	Treated Distillate
Vol. % of crude	85.0	84.0
Boiling range, deg. F.	220–800	190–760
API gravity	30.0	38.2
Sulphur, wt. %	3.0	0.04
Nitrogen, wt. %	0.32	0.06
Gasoline, vol. %	30.0	35.0
Catalytic carbon (wt. % catalyst)	7.2	
H_2 consumed, cu. ft./bbl. feed	700	

It was estimated that the catalyst would not require regeneration until at least 1,000 volumes of feed had been processed per volume of catalyst. Diesel fuels of high quality have been produced after fractionation of such treated distillates as the above, and gas oils are found to be exceptionally good as feed stocks for catalytic cracking operations.

Texas Firm Plans Carlsbad Work

The "Big Three" in potash operations at Carlsbad, New Mex., apparently will have a new neighbor this year. A Texas firm, Duval Texas Sulphur Co., operator of a small sulphur mine near Houston, has been authorized by Securities & Exchange Commission to change its name to Duval Sulphur & Potash Co. and increase its capital stock from 550,000 to 1,000,000 shares for the purpose of entering potash production at Carlsbad. Controlling the company is United Gas Corp., Shreveport, La., a large producer of natural gas.

Information is that the company plans the construction of potash mining and refining facilities to cost approximately $7.5 million and to have a mining capacity of 730,000 tons of ore per year. The combined present refining output at Carlsbad is approximately 1,000,000 tons per year (potassium oxide equivalent).

Addenda

A few additions should be made to your Directory of Western Chemical and Chemical Process Industries. On p. 48 you will find 28 new names that can be cut out and pasted into your February issue.

Integrated Production

IN THE WEST FOR THE WEST!

Westvaco PHOSPHATES

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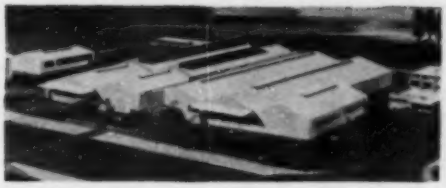

Big Paint Plant for Los Angeles

General Paint Corp. will build a million-dollar paint plant in the Vernon vicinity of Los Angeles. Planned initial production is 1.8 million gallons per year, with provisions for later expansion to 4 million gallons. At the new plant all lacquer required for General's foreign and domestic needs will be manufactured.

Included in the project is storage for nitrocellulose, a control and research laboratory, and a building for employees' cafeteria and recreation. Completion of the new plant is set for this fall.

In the West, General Paint has manufacturing and laboratory operations in San Francisco, Portland, Seattle and Spokane.

Liquid Carbonic Expands in B. C.

More carbon dioxide, both in the liquid and dry ice condition, is in store for British Columbia consumers in June. Liquid Carbonic Canadian Corp. is putting in a new $500,000 plant at Vancouver, B. C., having four times the capacity of the older plant, which will be dismantled and shipped to Jamaica. Capacity of the new facilities is reported to be 2,400 lb. per hr. of carbon dioxide.

NAMES IN THE WEST

R. B. Johnson

R. S. Custer

Russell B. Johnson has become assistant chief refinery engineer in the Bechtel Corp. at San Francisco. A graduate petroleum engineer from University of California, he has been with Bechtel over seven years. In the same firm, **Robert S. Custer,** graduate of California Institute of Technology, has become assistant chief process engineer.

Stuart W. Turner of Seattle, chemical consultant and agrologist, has joined the staff of the Washington State Aviation Association. He is acting as consultant to crop-dusters and crop-sprayers concerning procedures, precautionary measures and equipment.

James Scott has become U. S. Gypsum Co.'s board plant superintendent at Heath, Mont.

Bertram Keilin, who has been research chemist for Douglas Aircraft Corp., has become research associate at University of Southern California to participate in work on the structure of crystalline proteins.

A. L. Dietzel has become representative of the agricultural chemical department of Dow Chemical Co. in Colorado and New Mexico. Previously he was an official in McCarthy Chemical Co., Houston Tex., until the McCarthy plant near Houston ceased operations this year.

Louis E. Tallman has become technical service representative for Dow Chemical Co. on the West Coast, with headquarters at Los Angeles. The company says Tallman's appointment is the result of the recent growth of injection molding of plastics in the West Coast area.

Gordon R. Kay has resigned as president of Bay Refining Co., Denver, to assume the presidency of Morton Oil Co. in Wyoming.

Ralph Cope, professor of chemistry at Washington State College, Pullman, Wash., will retire this year after a service of 39 years.

Ralph A. McGoey has resigned from Union Oil Co. of California after 20 years of service, and has become a consulting petroleum engineer and geologist with headquarters at Bakersfield, Calif.

Vern L. Adams has retired after 40 years with General Petroleum Corp. At the time of his retirement he was assistant general manager of the production department.

C. A. Johnson, Socal Oil & Refining Co., has been elected president of Independent Refiners Association of California. Other 1950 officials are: **D. B. O'Neill,** vice president and general manager; **W. F. Barshfield,** Harbor Refining Co., vice president; **N. D. Taylor,** Hancock Oil Co., secretary-treasurer.

Robert G. Larsen, Shell Development Co., is 1950 chairman of the California Section of the American Society. Other officers include **Melvin Calvin,** University of California, vice chairman; **J. W. Burns,** Commercial Solvents Corp., secretary; and **F. D. Tuemmler,** Shell Development Co., treasurer.

G. L. T. Weidlein, formerly with the J. F. Prichard Co. at Los Angeles, is in charge of the San Francisco district office of Fluor Corp., serving in place of **Harold Armstrong,** who is convalescing from a recent illness. Prior to his short connection with J. F. Prichard, Weidlein was previously with Fluor for a number of years.

Ferdinand T. Kebely, owner and manager, K-Plastics, Inc., of San Francisco, has been elected chairman of the Pacific Coast section, Society of the Plastics Industry.

F. T. Kebely

E. Gelus

Edward Gelus has become assistant manager of the catalytic refining group of Shell Development Co. at Emeryville, Calif. He was transferred to his new post from the research laboratory of Shell Oil Co. at Houston, where he was chief research technologist.

R. M. Olive, formerly superintendent of Permanente Cement Co.'s Diamond division at Seattle, has been appointed head of the Seattle district office of Kaiser Aluminum & Chemical sales division.

George L. Tyler is the new West Coast manager for Du Pont's petro-

leum chemicals division. He replaces **David Conklin**, who has been transferred to company headquarters at Wilmington, Del.

George E. Durkee, who has been chemist for Rayonier Corp., at Shelton, Wash., has been promoted to the company's executive sales department in New York City. He has been with the company for 20 years.

Howard R. Irwin is the new special representative of Goodyear Tire & Rubber Co.'s chemical division at Cleveland, Ohio. He was previously technical superintendent of Goodyear's synthetic rubber plant at Torrance, Calif.

W. E. Boschin has become vice president and assistant general manager of Glass Containers, Inc., San Francisco.

W. C. R. Jones

W. C. R. Jones, for seven years assistant manager of the Beauharnois division of Hower Smith Paper Mills, has been appointed mill manager at the new dissolving pulp plant of Columbia Cellulose Co., near Prince Rupert, B. C. Before joining Hower Smith in 1940 he went to Australia in 1937 to assist in the design and early operation of the first chemical wood pulp mill in that country, at Maryvale, Gippsland.

Grant Spratt, Anglo-Canadian Oil Co., has been named president of Western Canadian Petroleum Association. Other officers: **S. F. Heard**, Royalite Oil Co., first vice president; **R. C. Brown**, Hudson Bay Oil and Gas Co., second vice president. Reappointed secretary-treasurer is **G. L. Humphreys**.

John B. Erickson has been named manager of the Utah-Nevada Division of General Petroleum Corp. He will be stationed in Salt Lake City. He replaces **V. I. Powels**, resigned.

Wm. Q. Hull has been named the American Chemical Society's associate editor in charge of the San Francisco Regional Office. He replaces **Frederick G. Sawyer**, who has joined the staff of Stanford Research Institute. Hull was previously in the industrial engineering department of Houston Lighting & Power Co., Houston, Tex. He is a chemical engineering graduate of Vanderbilt University.

FIRMS IN THE WEST

Pacific Portland Cement Co., is enlarging operations at Redwood City, Calif., with the construction of buildings to house a spray scrubber, kiln, wallboard plant and precipitation building.

Sterling L. Redman, for a number of years vice president and sales manager of Central Scientific Co., and for 15 years head of Redman Scientific Co., San Francisco and Los Angeles, has sold his interest in the latter firm to Central Scientific. He has established offices at 420 Market St., San Francisco, and 40 South Los Robles Ave., Los Angeles, and will engage in the sale of specialized equipment for pilot plants and laboratories.

Waxed Sil-i-cone Products, Inc., manufacturer of industrial, automotive and household products at Miami and Detroit, is planning a factory at Los Angeles to supply the western states. Robert E. Ryan has been chosen as factory representative, and the Andrew A. Scher Co. has been selected as southern California distributor for the firm.

Harper's Stain & Lacquer Co., Los Angeles, is planning an expansion of its factory at South Gate.

Los Angeles Chemical Co., Los Angeles, which has been operating the Calkins Co. as a division functioning as a laboratory and supply house since 1941, has dropped the name Calkins and has reorganized the group. H. J. Parsons, manager of the Calkins firm, has retired.

Aluminum Co. of America has awarded contracts for a $300,000 expansion at Vancouver, Wash., required by the completion of the firm's new rod, wire and cable plant.

Sprout, Waldron & Co., Inc., has established a subsidiary, Sprout, Waldron & Co. of California, at Oakland, Calif. to handle sales of the firm's equipment on the Pacific Coast and in the Rocky Mountain area. Managing the Oakland subsidiary is J. C. Hunter, vice president and sales manager.

Exchange Lemon Products Co., Corona, Calif., is expanding facilities to meet increasing requirements for lemon juice and lemon byproducts.

LaClede-Christy Co., St. Louis, has acquired Diamond Fire Brick Co., Canon City, Colo. Diamond Fire Brick manufactures various types of silica and other refractories.

Western Plywood Co., Ltd., will build at Quesnel, B. C., a $250,000 plywood plant, completion being scheduled for late 1951. Plant manager will be **Ian McQueen**.

Continental Can Co. expects to put its new $1.25 million can plant at Portland, Ore., into operation this month.

General Petroleum Corp. is installing equipment at Portland for the blending of oils previously blended in California.

Lever Bros. has made no change in its decision to build its recently announced $25 million soap and food products plant at Los Angeles, according to the company in a reply made to an inquiry from an up-state chamber of commerce following President Charles Luckman's resignation.

Kaiser Aluminum & Chemical Sales, Inc., chemical division, Oakland, Calif., has established a new Southwest sales district at Houston, Tex., to facilitate the sales of basic refractory materials. R. L. Petersen is head of the new district. J. T. Putnam, who previously headed the Pacific Northwest territory, has assumed charge of the sales area in Los Angeles, and R. M. Olive, previously superintendent of Permanente Cement Co.'s plant at Seattle, is in charge of the Seattle district.

Delhi Oil & Gas Corp. and **El Paso Natural Gas Co.** have made a new natural gas discovery in New Mexico near Farmington, where their well has tested 21.5 million ft. of gas per day from about 5,000 ft.

Cottage Grove Plywood Co. is the name of a new firm chartered in Oregon. The firm plans construction of a plywood plant at Culp Creek, Ore. Incorporators are Bohemia Lumber Co. and Buffelen Manufacturing Co., the latter a door and plywood manufacturer. Officers of the new firm are: Loren Stewart, president; S. C. Pohl-

man, vice president; Lawrence Chapman, secretary-treasurer.

Van Camp Laboratories, near Los Angeles, is installing equipment for the manufacture of an amino acid hydrolysate.

International Paint Co. of California, now manufacturing marine paints at San Francisco, has bought additional property there for the purpose of beginning the manufacture of interior and exterior industrial and household paints. Operations at the new plant will begin about May 1. The firm is a subsidiary of International Paint Co. of N. Y.

National Lead Co. has bought the assets of Schorn Paint Manufacturing Co. at Seattle. The properties, consisting of a paint plant and holdings in several paint stores, will be operated as part of National Lead's Pacific Coast branch.

Calaveras Cement Co., producer of cement at San Andreas, Calif., began the manufacture of white portland cement last month, thus becoming the fourth firm in the country to produce cement of this type, used for interior and exterior surfaces of structures, setting tile and other purposes. A subsidiary of the firm, Arizona Portland Cement Co., put into operation a few months ago at Rillito, Ariz., a new 2,000 bbl. per day plant, the first cement mill in the state.

Pennsylvania Salt Mfg. Co., with a low bid of 46.5 c. per gal., has obtained a contract from the Oregon State Forestry Department to supply 500,000 gal. of DDT spray for application by aircraft to a half million acres of forest affected by spruce budworm, a pest that has been invading the Douglas fir belt for several years.

Monsanto Chemical Co. has taken an option to buy 3,200 acres of phosphate land near Vernal, Utah. The properties involved are owned by Humphreys Phosphate Co., of Denver and by J. H. Ratliff of Cernal. A company official says a period of exploration will precede any decision to erect a plant.

Great Western Plywood Co. is a newly organized cooperative at Tacoma. The firm has bought for $300,000 the Tacoma plywood plant of Rainer Plywood Co., now being reorganized. The latter company has been operating for over two years.

Owens-Corning Fiberglas Corp. is considering making a 50 percent expansion in the capacity of its new plant at Santa Clara, Calif., in the next four or five years. The $7.5 million plant employs about 290 persons.

Salt Lake Refining Co. began driving piling last month for the 10,000 bbl. per day Houdriflow catalytic cracking unit the company expects to complete late this year in its refinery at Salt Lake City. Gasoline and distillate fuels will be produced by the unit.

Victor Chemical Co. of California, Inc., Los Angeles, has changed its name to Jackson Chemical Co. of California, Inc., announced President D. H. Jackson last month. He said there will be no change in either the management, board of directors or corporate structure. The firm produces industrial cleansers and finishes.

Beaman Plastic Products Co., Portland, Ore., is operating its new $250,000 plant for the manufacture of molded plastic products for industrial and domestic use.

Permanente Cement Co. has leased waterfront property at Anchorage, Alaska, to build a cement distribution plant to serve the rail belt area. Facilities to be installed include bulk

STAUFFER CHEMICAL COMPANY

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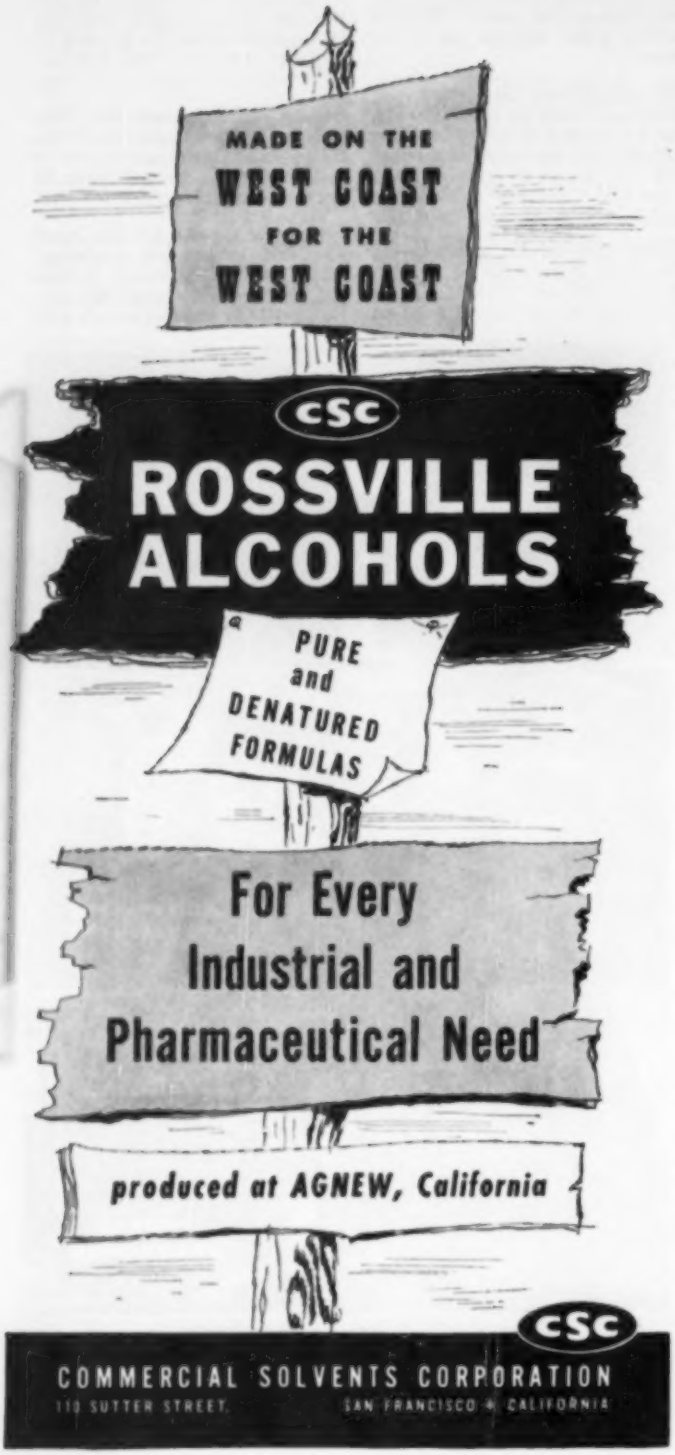


storage silos, sacking machinery and dockage. Cement will be brought there by water from the company's mill in California.

Purex Corp. has begun construction at San Leandro, Calif., of a plant to produce sodium hypochlorite bleaches for industrial and household use. The company completed a similar plant at Tacoma earlier this year.

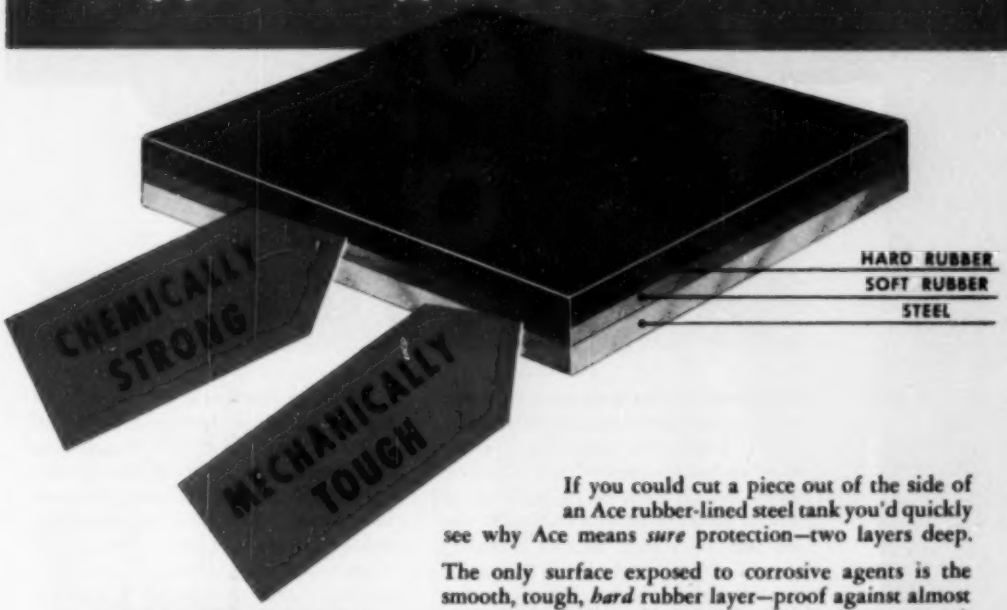
Royal Crystal Salt Co. has completed a new plant west of Salt Lake City to replace the previous installation, which was burned in January 1949. The increased capacity of the new plant is expected to be about 3,500 tons per 40-hr. week, which is practically twice the previous capacity.

Add These

Since the Directory of Western Chemical and Chemical Process Industries was issued in February, attention has been called to some omissions. These are listed below:

ADHESIVES *(Add to p. 9)*
Atwood Adhesives, Inc. Seattle, Wash.
National Starch Products, Inc. San Francisco, Calif.
CARBON DIOXIDE *(Add to p. 16)*
Witt Ice & Gas Co. Mosquero, N. Mex.
Union Oil Co. Santa Maria, Calif.
FERTILIZERS *(Add to p. 14)*
MIXED GOODS:
Agriform Co. Santa Ana, Calif.
Commodity Sales Co. Seattle, Wash.
General Foods Corp. Hillsboro, Ore.
Gresham Berry Growers Gresham, Ore.
Lynden Dept. Store Lynden, Wash.
Pacific Supply Co. Portland, Ore.
Pacific Supply Co. Madras, Ore.
Pacific Supply Co. Ontario, Ore.
Simplot Soil Builders Caldwell, Idaho
Simplot Soil Builders Idaho Falls, Idaho
Simplot Soil Builders Twin Falls, Idaho
Simplot Soil Builders Klamath Falls, Ore.
Valley Wholesale & Warehouse Co. Ontario, Ore.
Washington Coop. Fertiliser Ass'n. Yakima, Wash.
Wells & Wade Wenatchee, Wash.
LIQUID PRODUCTS:
Agriform Co. Holtville, Calif.
Agriform Co. Indio, Calif.
Agriform Co. Santa Ana, Calif.
Agriform Co. Wasco, Calif.
PHOSPHORUS:
Stauffer Chemical Co. Richmond, Calif.
GLASS *(Add to p. 14)*
Waterway Projects, Inc. Los Angeles, Calif.
LIME *(Add to p. 16)*
West End Chemical Co. West End, Calif.
PESTICIDES *(Add to p. 20)*
Agriform Co. Holtville, Calif.
Agriform Co. Wasco, Calif.

ACE *Rubber-Protected* EQUIPMENT

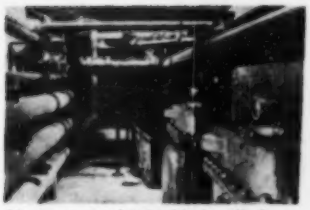


If you could cut a piece out of the side of an Ace rubber-lined steel tank you'd quickly see why Ace means *sure* protection—two layers deep.

The only surface exposed to corrosive agents is the smooth, tough, *hard* rubber layer—proof against almost every acid, alkali, and corrosive salt. It's also age-proof. Underneath is a layer of resilient, shock-resistant soft rubber that firmly bonds the hard rubber to the steel—a bond so strong the rubber can't be peeled off, and won't loosen or blister. There's extra protection at the seams, and in the well-rounded fillets and corners. Flanges, too, are rubber faced.

Ace also provides all-hard-rubber or all-soft-rubber linings, of natural or synthetic rubber. Ace rubber protected tanks, pumps, piping, valves, fittings and utensils are available in standard or special constructions for complete chemical processing, storage or circulating systems. Write for "Ace Rubber Protection," 64 pages of data you'll find valuable.

ACE PLASTICS: Investigate Ace corrosion-resistant plastics too, such as Ace Saran and Parian (polyethylene) pipe, tubing, fittings and molded parts. With both hard rubber and plastics to choose from, we'll be glad to recommend the *one best* material for any job of yours.



No "guess-work" in this installation—it's practically all Ace-protected. Here you see Ace rubber-lined pipe, fittings, valves and tanks and Ace all-hard-rubber pipe and fittings handling corrosive liquids.

Ace rubber coverings can be applied to intricate shapes, such as conveyor screws, agitators, etc. These typical mixer parts are lined with Neoprene.

ACE SINCE 1851

AMERICAN HARD RUBBER COMPANY · 11 MERCER STREET · NEW YORK 13, N. Y.

EVAPORATIVE COOLING

—as developed by

Swenson Process Engineering

Evaporative cooling is an economical way to reduce the temperature of materials-in-process. It uses no cooling surfaces—therefore can be recommended where conventional cooling methods are attended by serious problems of tube-fouling. It also has advantages when the cost of cooling water is a factor; and when it is desirable to reclaim heat to provide clean, hot process-water.

Swenson equipment for evaporative cooling is designed for easy cleaning and sterilization, thus keeping down labor costs. It operates with very little entrainment, which reduces stream-pollution problems and prevents the waste of materials.

Typical current uses of evaporative cooling are for the production of CAUSTIC SODA, for cooling MASH in distilleries and industrial alcohol plants, and for cooling SUGAR solution in conjunction with ion exchange. Such units are designed in multiple stages to operate over a wide temperature range, making it possible to cool materials from very high to relatively low temperatures.

Many additional applications are practicable, since the equipment may be built either with corrosion-resistant materials or with steel. Swenson engineers will gladly consult with you on potential uses for evaporative cooling in your processes.

Only SWENSON PROVIDES THIS FIVE-WAY SERVICE

Analysis of Requirements | Design and Layout | Manufacture of Equipment | Test Operation | Periodic Check-Ups

SWENSON EVAPORATOR COMPANY

Division of Whiting Corporation

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Eastern Sales Office and Export Department: 30 Church St., New York 7, N. Y.
In Canada: Whiting Corporation (Canada) Ltd., 47-49 LaPlante Ave., Toronto 2

Flow diagram of typical installation for evaporative cooling. Each section (as here indicated) may consist of multiple stages.

Where Gas-Tight Protection is Paramount

AO Rubber Frame Chemical GOGGLE

This Single Lens, All-Rubber Frame Goggle gives the Safety and Vision Required

Worn directly over the eyes or over most personal glasses, the AO701 Goggle with large single acetate lens is recommended for chemical operations where the utmost security is needed against splashes, spray, impact and fine dusts. (AO companion model 700 Goggle with ventilation slots is recommended for less severe exposures). Your nearest AO Safety Products Representative can supply you.

Quick Facts

Gas tight, snug fitting frame of acid-resisting, non-irritating rubber. Molded to conform to face. Bridge and other face-contacting edges have broad bearing surfaces—distribute weight widely for comfort.

Lens is large, shatter-resistant acetate, provides exceptional seeing area and is easily replaceable. Conforms to optical specifications.

All-rubber, comfortable, adjustable headband.

Both the 700 and 701 goggles available with either AO dust or chemical cartridge respirators as in photo above. Can be attached with snap for temporary use or permanently riveted.

American Optical

SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

They're Both Marley Towers

Which Do You Need?

YOU want a cooling tower that will handle your water cooling job effectively at the least possible cost!

But, do you know which cooling tower will do it?

That's where Marley "know-how" fits into your picture. You have a water cooling job to do. There's a Marley designed and Marley built cooling tower to meet every water cooling need. Marley trained Application Engineers, working with you from the blue-print stage on, will help you get more for your money and assure complete, lasting satisfaction.

Shown above are two of the many Marley cooling towers from which Marley engineers can make a selection to fit your need:

The VAIRFLO (left) a medium capacity cooling tower with extra quality features at no extra cost. Vairflo extras include a balanced spray system with patented Marley low pressure nozzles . . . totally enclosed motor . . . grease packed ball bearings in enclosed bearing housing . . . lifetime nail-less filling . . . filling that is easily removed and installed . . . complete basin fixtures . . . Marley-designed cooling tower fan . . . multiple cells if desired . . . extra heavy framing and casing to give unusually long service. The Vairflo sets a new standard for air conditioning and refrigeration service. Available in wood or steel. Bulletin V-50.

The CONVENTIONAL (right) with a model to meet all heavy duty water cooling requirements. Only Marley Conventional towers offer all these features . . . rigid fan cylinders . . . cast aluminum or stainless steel fans . . . motors propery located outside the fan cylinder . . . positive drive action . . . drift eliminators independent of the distribution system . . . spray nozzle distribution . . . nail-less filling . . . independent louver posts . . . exclusive Marley mechanical equipment. Available in wood or steel. Asbestos board casing if desired. Bulletin C-50.

For guaranteed performance at lowest possible cost, ask a Marley Application Engineer to study your cooling requirements with you, from the blue-print stage on, and to give you a fair and impartial recommendation for the type of equipment that best meets your need. There's no cost nor obligation.

MAIL THIS COUPON TODAY

The Marley Company, Inc., Kansas City 15, Kansas

☐ Please send me, FREE, your latest illustrated folders entitled, "What's Your Cooling Tower I.Q.?" I'm particularly interested in Cooling Tower Maintenance, Operation, Specifications, Testing, Water Treatment, Water Distribution.

☐ Have a Marley Application Engineer call to discuss our water cooling problem.

CE-4

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MARLEY

Double-Flow Vairflo DriCooler Natural Draft Counter-Flow Aquatower Spray Nozzles

DISCHARGED FROM ACTIVE DUTY

When the '1000' VALVE Goes on the Job . . . . These Troublemakers are THROUGH . . .

CASH STANDARD Streamlined PRESSURE REDUCING VALVE TYPE 1000

What this user says IS PROOF:

"The type '1000' valves we have in our plant are used on our heating system and washers and degreasers. Our heating system is almost entirely unit heaters and with varying conditions, the valves are called on to operate at both small capacities and wide open. When the wind is mild the valves are practically dead ended and when the weather is cold, the valves are called on to open and close very rapidly. On our washers and degreasers we don't have anything else but the Cash type '1000.' Our oldest valves in the plant are seven years old, but they are working perfectly."

WRITE FOR BULLETIN 962

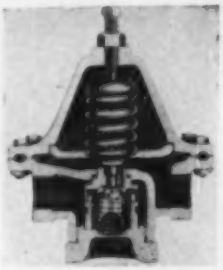
ITS ASPIRATOR AND STREAMLINED FLOW WORK TO YOUR BENEFIT IN THESE 12 WAYS . . .

1. Maximum Capacity when needed most. 2. Accurate Pressure Control under toughest working conditions. 3. Trouble-free Service. 4. Smooth Operation. 5. Tight Closure. 6. Accurate Regulation. 7. Speedier Production Results. 8. Elimination of Failures. 9. Constant Delivery Pressure. 10. Cost Saving Operation. 11. No Spoilage. 12. Practically zero in maintenance costs.

CASH STANDARD CONTROLS . . . VALVES

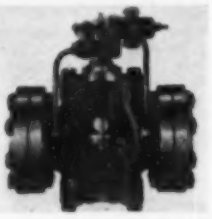
A. W. CASH COMPANY
DECATUR, ILLINOIS

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES
Send for them



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.

Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.

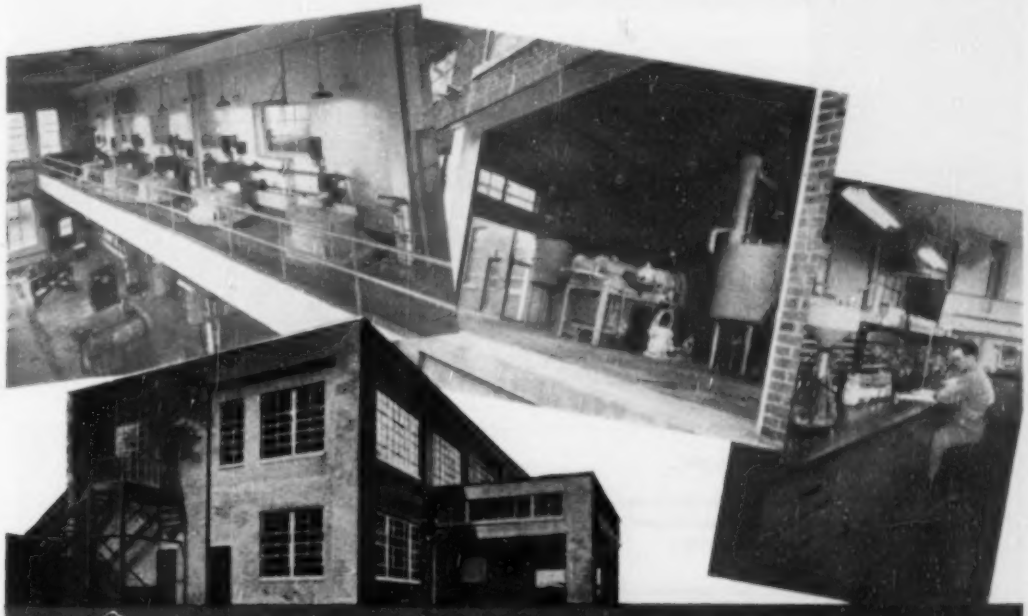


Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

NOW, YOU CAN GET THE FACTS ON SOLIDS-LIQUIDS SEPARATION PROBLEMS IN HOURS INSTEAD OF WEEKS OR MONTHS

The Bird Research and Development Center is the only plant that contains everything in the way of equipment and experience to develop authentic and prompt findings on every solids-liquids separation problem whether it involves materials as large as a half inch or as small as a single micron.

Why not make the most of these unique and comprehensive facilities. It puts you under no obligation and may result in better products and more of them per day at lower cost.



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SOUTH WALPOLE • MASSACHUSETTS

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Bromine is now readily available in bonded, lead-lined drums and tank cars. An oxidizing and brominating agent, bromine is used in the manufacture of photographic chemicals, bromides for medicinal uses, brominated dyes, lachrymators and industrial uses.

For additional information about bromine and the handling of liquid bromine, clip coupon below and send for informative literature. For technical assistance write us here at Midland.

SPECIFICATIONS:

Bromine, not less than	99.7%
Chlorine, not more than	0.1%
Specific Gravity at 20/15°C., not less than	3.1

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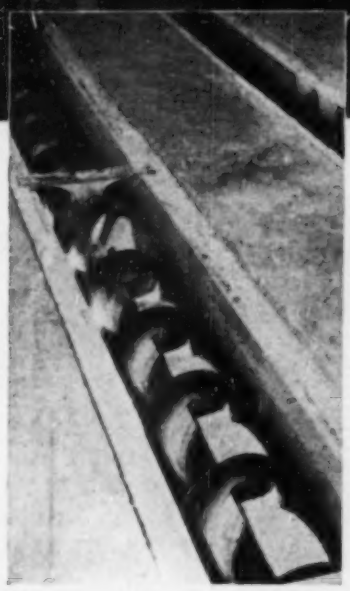
SCREW CONVEYOR
is Outstanding . . .



Pictured above is a screw conveyor installation handling cotton-seed meats to flaking rolls. Lower illustration shows a 12" diameter screw conveyor handling rough rice from dump hopper to mill.

Link-Belt originated and is the largest producer of continuous rolled Helicoid (screw) conveyor. Link-Belt also manufactures many other types of screw conveyors, including sectional flight, in a wide range of diameters and gauges, and in various metals, including stainless steel for conveying jobs where a sanitary metal is desirable. All necessary components such as collars, couplings, hangers, troughs, box ends, flanges, thrusts, drives, etc., are also available to give you one source of supply.

Link-Belt screw conveyors are compact, occupying less space than many other types of conveyors and therefore can be adapted to close clearance locations. Loading is simple—thru spouts or from adjacent conveying mediums. Covers and joints are tight, and dust seals and spring cover clamps keep dirt out, dust inside. Installation and operating costs are low.

Link-Belt engineers will be pleased to study your conveying problem and recommend a conveyor to suit your specific needs. Contact our nearest office for unbiased recommendations.

LINK-BELT COMPANY

Chicago 8, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

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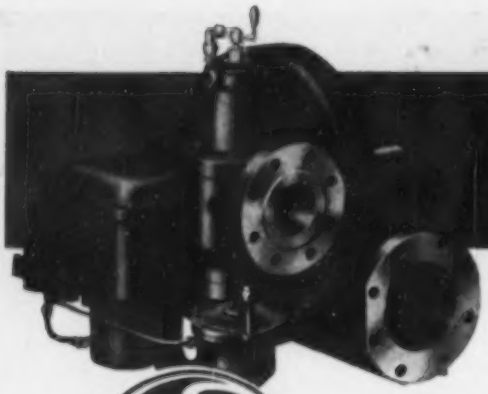
LINK-BELT
SCREW CONVEYORS



SAVE

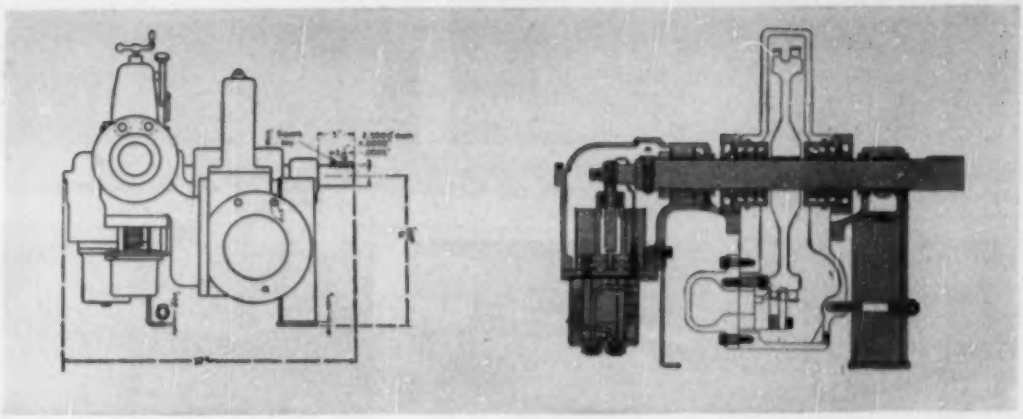
TYPE **DP**

General Electric's DP turbines, available in three frame sizes and a variety of ratings, can be profitably used in many different applications, yet they compose a standard line and incorporate standard parts. This standardization gives you four important benefits:

1 EASY TO STOCK SPARES Because most parts are interchangeable on all models, spares can be stocked at low cost. A spare parts kit, containing 91 items, can be obtained with the turbine. This simple method of stocking spares lowers maintenance costs and provides protection for several DP's in your plant.

FOUR WAYS

WITH Standard Turbines



2 INSTALLATION SIMPLIFIED

All models, regardless of frame size, horsepower, or speed ratings, have identical shaft height, keyways, and coupling fits. Thus, installation problems are simplified, and you can move these center-line supported units from job to job without a "custom line-up."

3 GREATER FLEXIBILITY

As the shaded parts in the diagram illustrate, most DP parts are identical on all frame sizes and ratings. In this way, you can adapt a DP for different job requirements with only minor changes. A different nozzle plate gives you a different horsepower output. A change in governor gears provides a new speed range. When modernization programs demand a change in plant operation, the DP's flexibility will save you money.

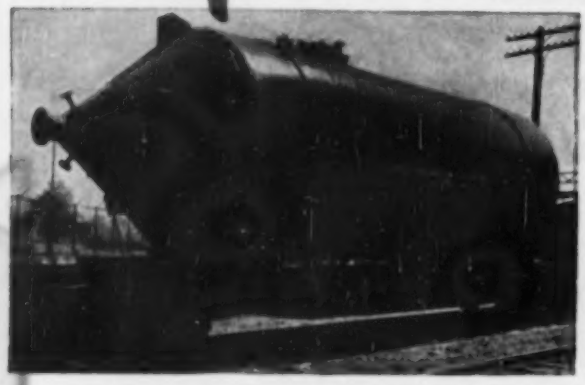
4 A BETTER TURBINE

Manufacturing savings from standardization are passed on to you in the form of special features at no extra cost. For instance: hydraulic governing, combined trip-throttle valve, 30% speed range are advantages you'd expect to find only in custom equipment.

Ask your General Electric representative for full details about the DP mechanical-drive turbine or write for bulletin GEA-4955. Get the full details on how standardization will benefit your plant operation. Apparatus Department, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

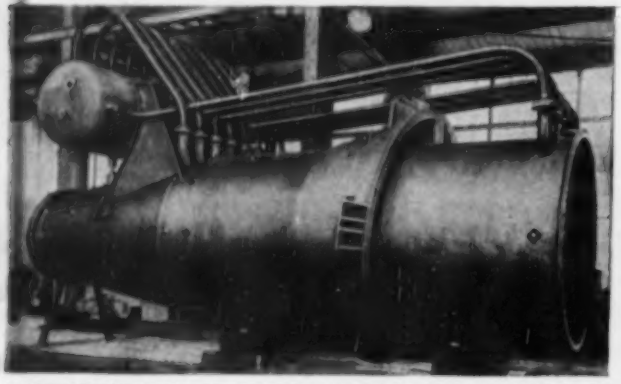
You name it-We

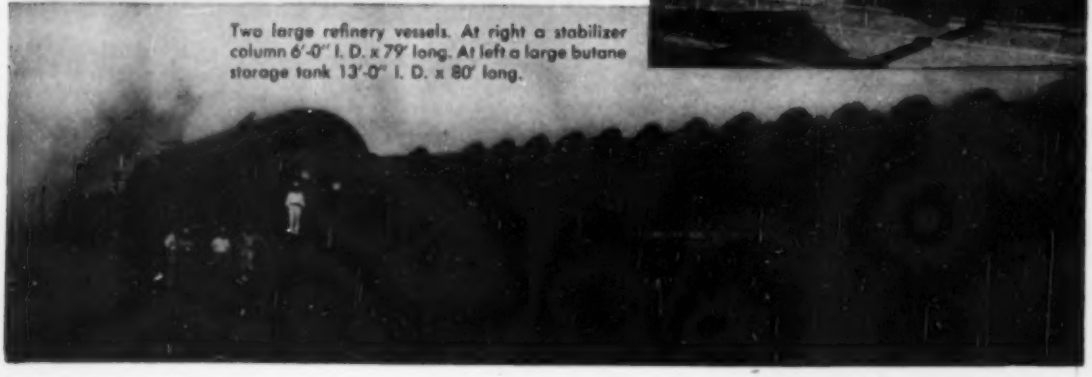


A cylindrical type digester for the paper industry; 10'-6" dia x 40'-9½" overall length.

A waste heat boiler of special design, one of many built for high octane gas plants.

Contactor for aviation gasoline manufacture. 95½" O. D. x 21'-6" long.

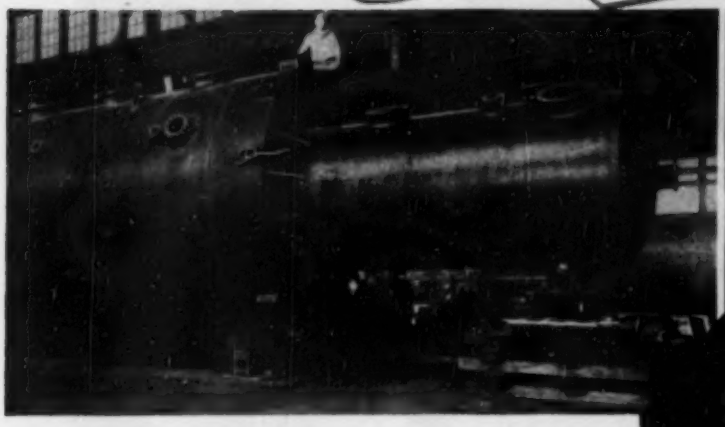




Two large refinery vessels. At right a stabilizer column 6'-0" I. D. x 79' long. At left a large butane storage tank 13'-0" I. D. x 80' long.

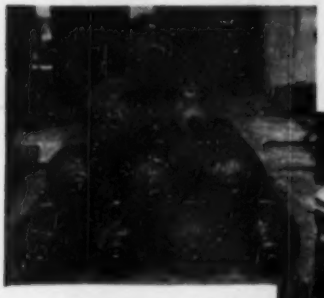
build it

Large or Small
Simple or Complex



A large atmospheric tower. Large section 13'-0" I. D.; small section 7'-0" I. D.; overall length 107'-4".

A large fractionating tower. Large section, 13'-4" O. D.; small section, 10'-1" O. D.; overall length, 99'-1½".



A group of air bottles, 16" O. D. x 54" long; made for 900 psi working pressure.

Nickel-clad steel processing vessel for the manufacture of plasticizing materials.

The accompanying photographs illustrate the wide variety of fabricated work done by Combustion Engineering — Superheater.

Combustion offers you years of experience in this highly specialized field — experience in actually producing thousands of these vessels, simple and complex — large and small. This experience has frequently made it possible for our engineers to suggest minor changes in specifications which have effected substantial reductions in fabricating costs.

May we have the opportunity to quote on your next pressure vessel requirements?

8-335

COMBUSTION ENGINEERING—SUPERHEATER, Inc.

When You Specify
SOLVAY Products
for Soap • • •
. . . you get the ultimate in quality—the kind of quality you would expect from America's leading producer of alkalies. But in addition, you get the fast, dependable delivery service which can only come from a company having more than one plant . . . and over two hundred local stock points from coast to coast. Solvay's exclusive Technical Service is also available, at your request.
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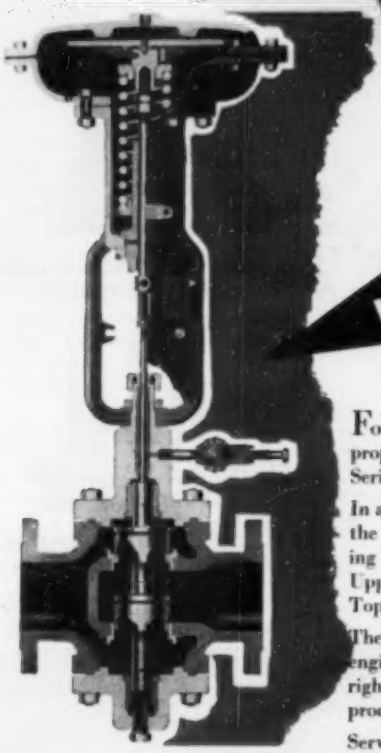
CALCIUM CHLORIDE
Soda Ash • Caustic Soda • Caustic Potash • Chlorine • Potassium Carbonate • Calcium Chloride • Sodium Bicarbonate • Specialty Cleansers • Sodium Nitrite
Nytron • Ammonium Bicarbonate • Para-dichlorobenzene • Ortho-dichlorobenzene • Monochlorobenzene • Methanol • Ammonium Chloride • Formaldehyde

• There are many diaphragm control valves...but

You'll WANT THE

HONEYWELL SERIES "700"



For a diaphragm-operated valve that affords utmost precision in proportional high-lift control . . . your best bet is the Honeywell Series "700."

In addition to the usual features you expect to find in a fine valve, the "700" gives you: Pre-molded Neoprene Diaphragm with Rolling Action, Pivot-Mounted Inner Plate and Cradle-Mounted Upper Spring Flange, Duplex Bearing for Stem, One-Piece Bonnet, Top and Bottom-Guided Disc.

The quality of the Series "700" stems from years of research and engineering know-how . . . in designing the right valve, from the right material, with the right specifications for the more complex process applications.

Service, when needed, is available from the Honeywell nationwide network of branch offices and factory-trained field engineers . . . as near to you as your phone. Call in your local Honeywell engineer today . . . for detailed information.

Investigate the Series "700" . . . today . . . write for Bulletin 700-2

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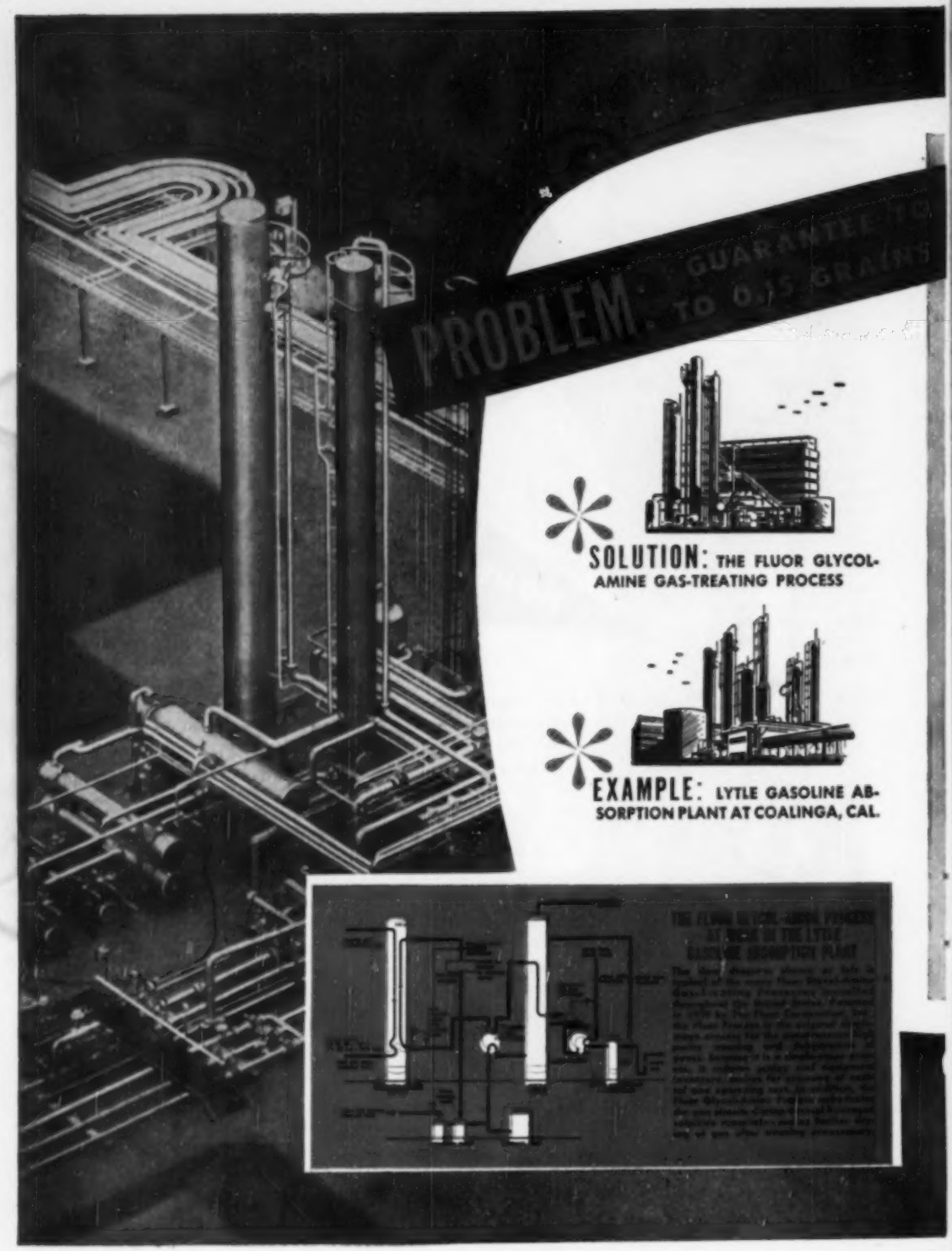
DIAPHRAGM VALVES
AND PROCESS CONTROL SPECIALTIES


PROBLEM:
SOLUTION: THE FLUOR GLYCOL-AMINE GAS-TREATING PROCESS
EXAMPLE: LYTLE GASOLINE ABSORPTION PLANT AT COALINGA, CAL.

The Lytle Gasoline Absorption Plant at Coalinga, California, is a story of the Fluor Glycol-Amine Gas-Treating Process at work.

Expansion of natural gas supply through deeper drilling introduced into the Lytle Plant a natural gas so high in hydrogen sulphide content that it was no longer acceptable as commercial sales gas. After processing for gasoline recovery, the discharge gas was analyzed and found to contain 1.25 grains of hydrogen sulphide per 100 SCF and up to three-fourths of 1 mol per cent of carbon dioxide. Even though this gas was sufficiently pure for sale in many areas, in this particular instance requirements for commercial gas were set to *not more than 0.15 grains of hydrogen sulphide per 100 SCF...* a purity requirement so stringent that it would only be attempted by Fluor Gas Processing Engineers using the Fluor Glycol-Amine Gas-Treating Process.

Following study of the requirement by Fluor, a Research Department pilot plant was set to run at gas composition and operating conditions simulating those at the Lytle Plant. Here it was *proved* the Fluor Glycol-Amine Gas-Treating Process could meet—*and exceed by a comfortable operating margin*—the 0.15 grain per 100 SCF requirement efficiently, economically, and on a guaranteed basis.

The plant for the Lytle job was then designed on the findings of the Fluor Research Department. Engineering was set in motion, and a field construction schedule formulated.

The Lytle unit is a "sweet"-running unit paralleling laboratory and pilot plant findings—meeting its guaranteed performance with an adequate margin. This new installation raises the total installed capacity of Fluor Glycol-Amine Gas-Treating Plants to 585,000,000 SCF/D.

Fluor invites owners and operators of gas-producing properties to submit their gas-treating problems for study and recommendation by Fluor's Gas Processing and Research Engineers. Let them study *your* particular problem—the range of purity obtained through use of the Fluor Glycol-Amine Gas-Treating Process is virtually unlimited. It may be the low-cost answer to your gas-treating problem.

Technical papers by Fluor research and engineering personnel are offered on the subject of gas treating—free copies are available by writing The Fluor Corporation, Ltd., Los Angeles 22, California.

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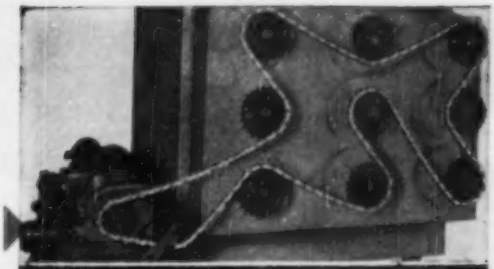
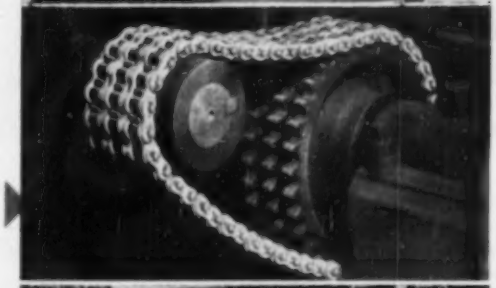
FLEXIBLE!

Link-Belt Precision Steel Roller Chain is flexible; a series of linked rollers that form a flowing highway of power.



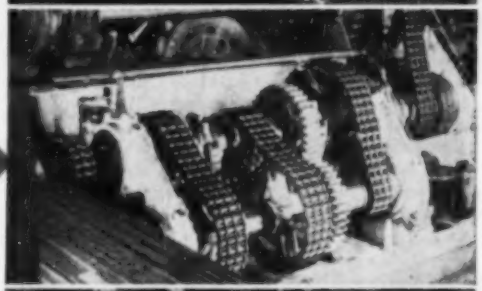
POWERFUL!

Link-Belt Precision Steel Roller Chain can be applied to small fractional horsepower machines or to units involving more than a thousand horsepower.



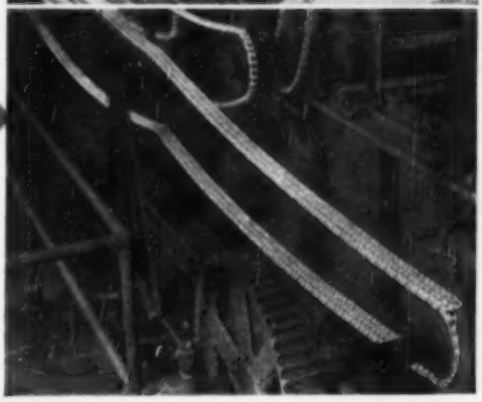
SHORT CENTERS!

Link-Belt Precision Steel Roller Chain can be used on short centers at high ratios. Adapted to withstand heavy starting loads and severe shock.



LONG CENTERS!

Link-Belt Precision Steel Roller Chain is adapted to coordinate motion of widely separated shafts, affording positive operations.



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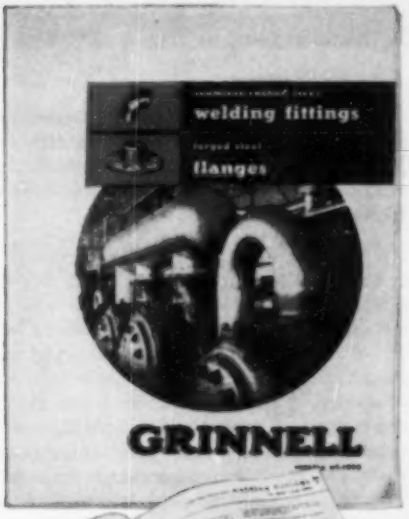

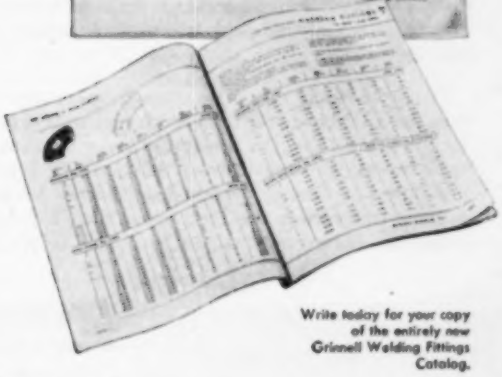

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Table of Contents

STEEL BUTT WELDING FITTINGS

90° elbows . . . long radius, short radius, light gauge, special wall thicknesses
45° elbows . . . long radius, light gauge, special wall thicknesses
180° returns . . . long radius, extra long radius, short radius, light gauge, special wall thicknesses
tees . . . straight, reducing
crosses
reducers
laterals
lap joint stub ends
caps
weldolets
backing rings
dimensional tolerances

FORGED STEEL FLANGES

welding neck . . . 150 to 2500 lbs.
slip-on . . . 150 to 2500 lbs.
lap-joint . . . 150 to 2500 lbs.
threaded . . . 150 to 2500 lbs.
blind . . . 150 to 2500 lbs.
socket type . . . 1500, 2000, 6000 lbs.
reducing . . . threaded and slip-on 150 to 2500 lbs.
orifice . . . slip-on; welding neck; welding neck, ring joint; threaded, 300 to 1500 lbs.
flange extras
dimensional tolerances
minimum finished bores
flange facings
facing dimensions of ring joint flanges
thread standards and threading practice
service pressure ratings
physical and chemical requirements

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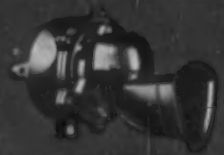
with CROUSE-HINDS
. . . . . bells, horns, sirens, and visual signals

Raintight signals for non-hazardous locations

The most complete line

Type SW Raintight Horn with Grill



Type SW Raintight Horn with Single Projector

Type SW Raintight Horn with Double Projector

Type FS Raintight Pilot Light Condulet

Continuous production is of vital importance in successful plant operation. Costly shutdowns can often be avoided by Crouse-Hinds signals that give an instant warning of abnormal operating conditions or sound an alarm in case of fire.

A wide variety of signals is necessary to meet the varied conditions in industry. Crouse-Hinds offers a comprehensive line of signaling devices for plant protection and communication . . . . . sirens, horn, bells, and visual signals. Each unit is designed with individual characteristics that make it superior for a particular kind of service. There are Crouse-Hinds signals for use in non-hazardous locations; raintight signals for use where exposed to the weather; explosion-proof and dust-tight signals for use in hazardous locations; signals with a low volume of sound and high power signals that are extremely loud.

You have a definite advantage in selecting signals from the all-inclusive Crouse-Hinds line. It is possible for you to meet the requirements of every location. In noisy areas the character of the noise is of first importance. A signal producing a sound having the greatest contrast to the area noise should always be selected. For example, a horn would not be suitable in

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Signaling Devices

for control of operations, and fire protection.

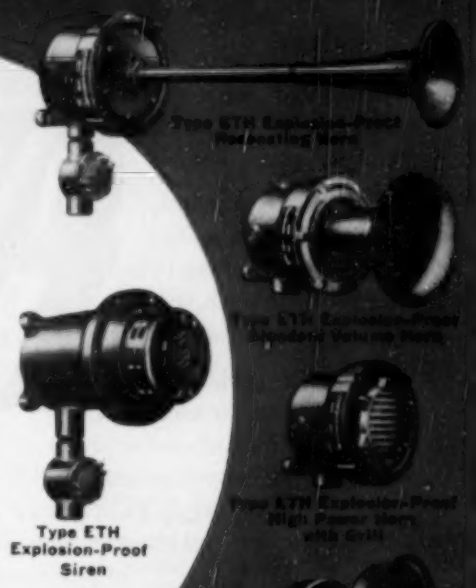
of explosion-proof and dust-tight signals for hazardous locations

surroundings where a constant hum or whine is present but a bell could readily be heard. A bell would be inadequate in surroundings where the noise is produced by hammering on metal but a horn would give the required contrast.

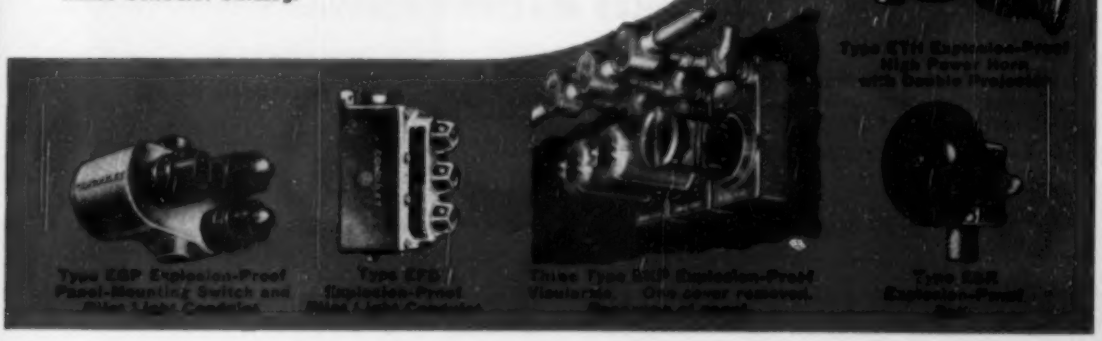
Careful consideration should also be given to the number of signals required. In general, much better coverage is obtained by even distribution of several low output units than by one or two high output units. On the other hand, a high powered unit is necessary when the sound must be projected a considerable distance from one location.

Crouse-Hinds' line of visual signals includes a variety of pilot lights and also the Visularm, a compact unit used to supervise manufacturing processes. The Visularm will automatically indicate normal and abnormal temperature, liquid level, speed, load, or any other condition which can be electrically coupled to the circuit. An independent circuit is provided in the Visularm to actuate an audible signal.

In Crouse-Hinds' complete line there are dozens of different units from which to choose the items to meet your particular requirements. They are all listed in the Crouse-Hinds Condulet Catalog.



Type ETH Explosion-Proof Siren



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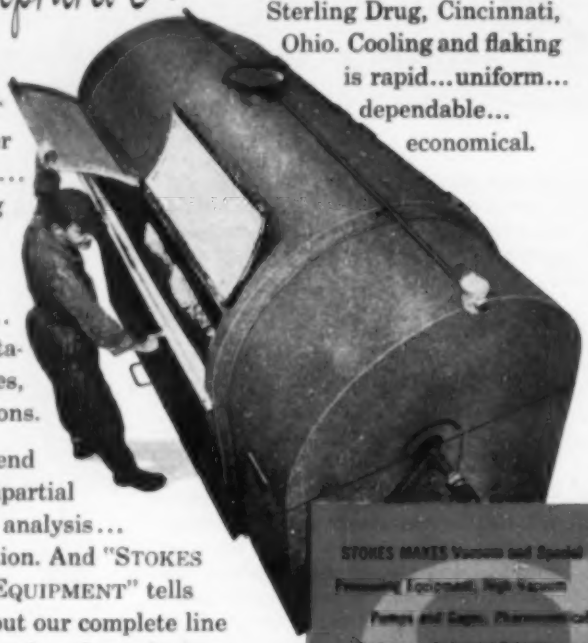
Beta-Naphthol is flaked on Stokes Single Drum Flakers at the Hilton-Davis Chemical Co. Division of Sterling Drug, Cincinnati, Ohio. Cooling and flaking is rapid...uniform... dependable... economical.



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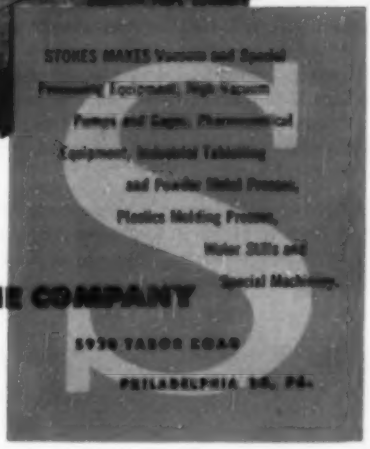
Stokes Flakers are practical, profitable production units... whether they are flaking beta-naphthol, asphalt, pitch, waxes, fatty acids—in pounds or tons.

If flaking is your problem, send your samples for an impartial production-and-cost analysis... there is no obligation. And "STOKES PROCESSING EQUIPMENT" tells all about our complete line of profit-producing processing machines.



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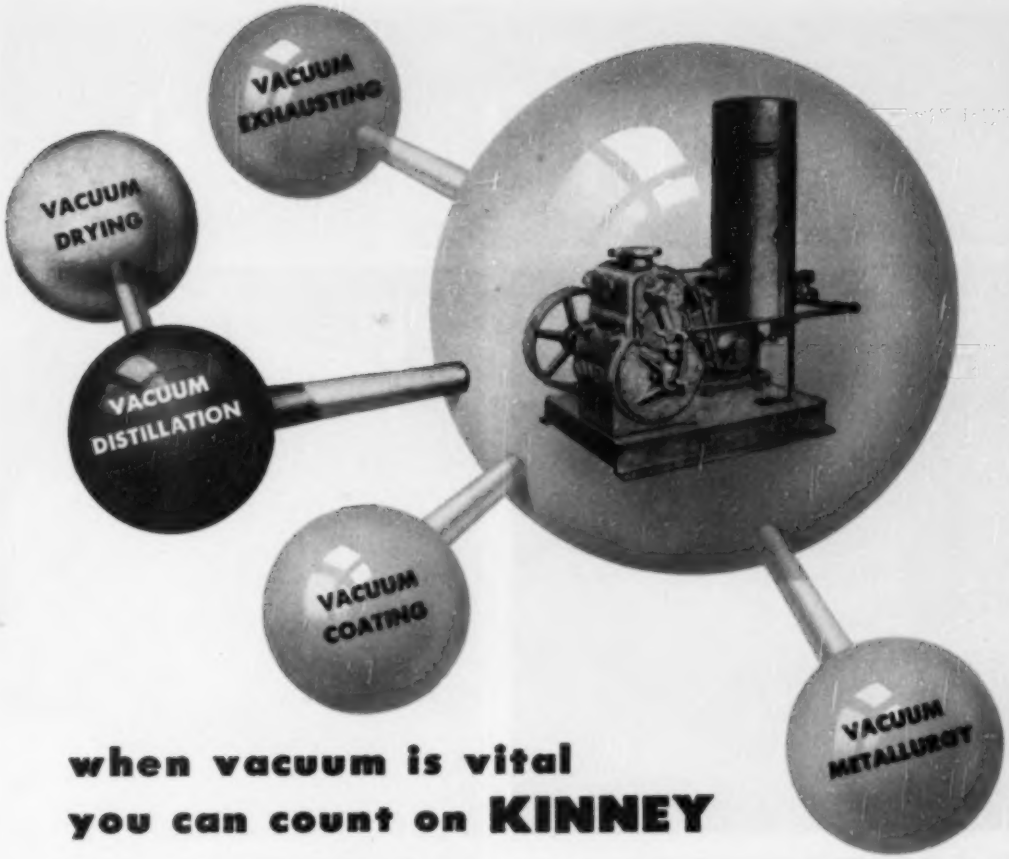

when vacuum is vital you can count on KINNEY

Kinney High Vacuum Pumps are at work in all phases of low pressure processing — in the production of television tubes, titanium, penicillin, electrical condensers, coated camera lenses, dehydrated foods, and scores of other products. Their dependability and high pumping speed have helped bring vacuum out of the laboratory and onto the production line. Kinney Pumps are establishing important records both for length of service and economy of operation. They are virtually a "production must" whenever processes require fast pump down to low absolute pressures.

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THE WETTER THEY ARE THE FASTER THEY SINK—applies to many things besides wet-flies in trout fishing. Lowering of surface and interfacial tension is essential to improve and accelerate many industrial processes, and there Cyanamid's AEROSOL® Wetting Agents come into play. Added to water and other suitable liquids, they accelerate penetration and the wetting of solids, and they often increase the reaction rates between two or more immiscible liquids. Produced in a variety of types and grades, the AEROSOL line includes the most powerful wetting and surface active agents available.

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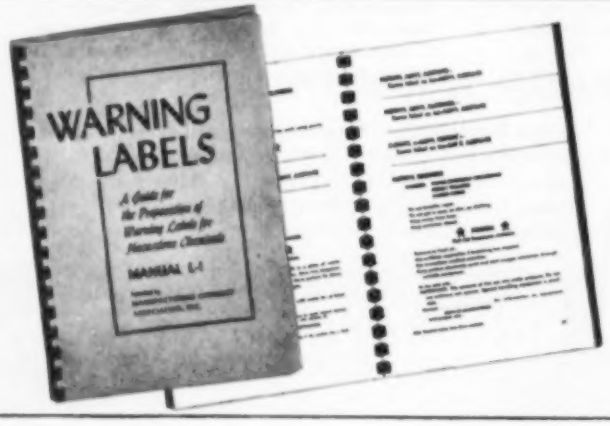
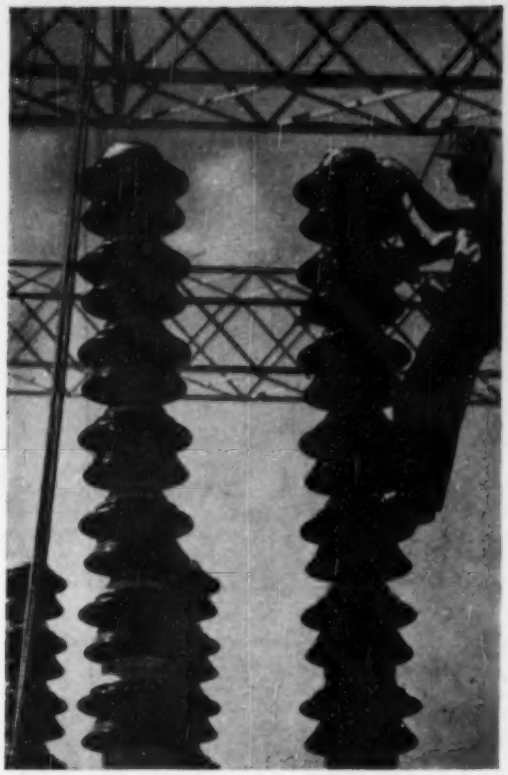


NEW GUIDE FOR THE PREPARATION of warning labels for hazardous chemicals, this manual, "Warning Labels" is now available in a completely revised edition from the Manufacturing Chemists' Association. It discusses general principles involved in the design and preparation of warning labels for hazardous chemicals, and includes illustrative warning labels for industrial chemicals and for economic poisons. The manual is intended to facilitate an effective, uniform pattern of chemical labeling throughout the nation, and to protect the ultimate consumer in handling and using chemicals. Copies are available at $1.00 each, from the Association, 246 Woodward Building, Washington 5, D. C.

Chemical Newsfront



THE UNCTUOUS NATURE OF METALLIC STEARATES makes them particularly useful as dry lubricants in molding ceramic electrical insulators such as those shown here, and in molding metal powders for the production of oil-less bearings, magnets and intricate machine parts. Cyanamid's AERO* Brand Stearates are ideally compounded for use as dry mold lubricants. Their addition to the powder before molding assists in the flow to the mold without "bridging" and gives denser and more uniform packing of the powder in the mold.

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G-E molded plastics hood for outboard motor.

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For information on any G-E Chemical Department products, write Chemical Department, General Electric Company, Pittsfield 14, Massachusetts.

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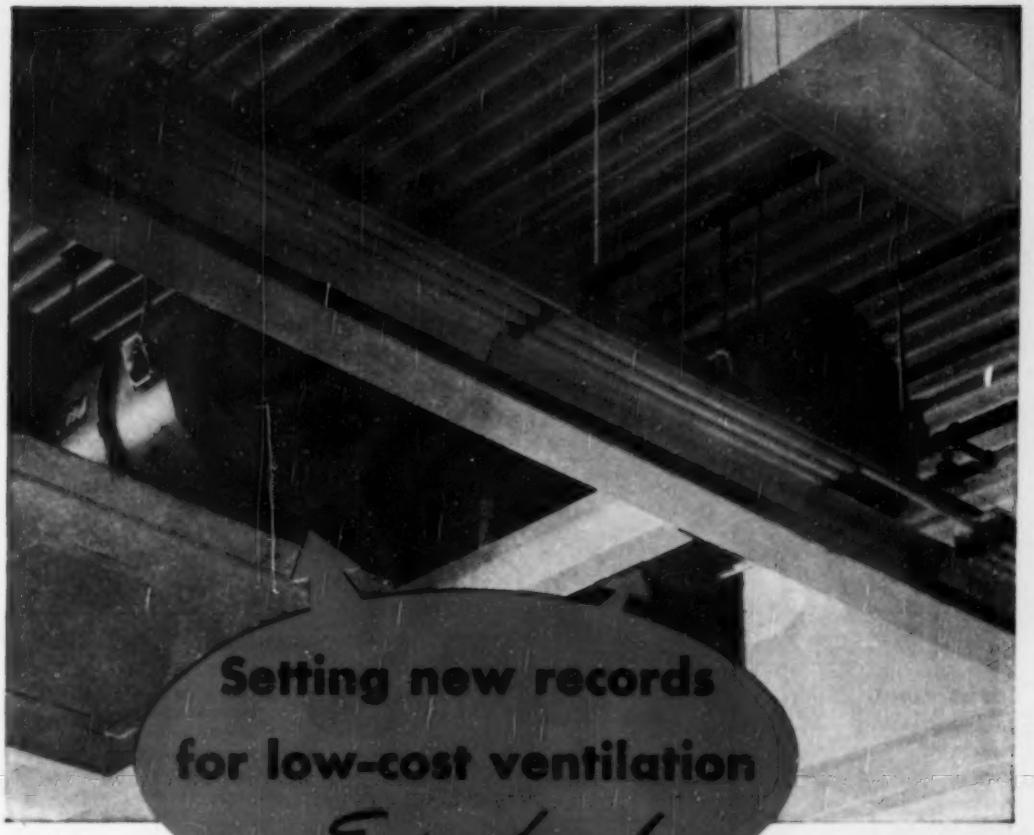

JOY AXIVANE* FANS

WITH JOY AXIVANE Fans, you profit by the greater efficiency, quieter and smoother operation, and lower power consumption of their vaneaxial design. You save on installation, too. These light, compact, in-line fans mount directly in the air duct—saving space and time, making foundations, guards, etc. unnecessary. What's more, the important adjustable-blade feature of JOY Fans gives you extra flexibility—permits easy adjustment on the job to suit new conditions or compensate for faulty duct work. ● Let us show you how to get *best* ventilating results!

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WAD 12258

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This famous stitch is tough enough to hold when bags are roughly handled. The "Cushion Stitch" absorbs strains, won't pull out, yet provides an easy-to-open closure. "D A" Bagpaker automatically applies tape with latex over the sewing — ET Bagpaker applies Dry Tape before sewing.

A MAKER OF MULTIWALL BAGS knows

For tight and fast closing of multiwall paper bags from 25 to 100 pounds capacity — be sure to investigate these Bagpaker Machines. They are designed and serviced by the makers of Bagpak® Multiwall Bags . . . by the men who are familiar with *your* multiwall bag packing needs.

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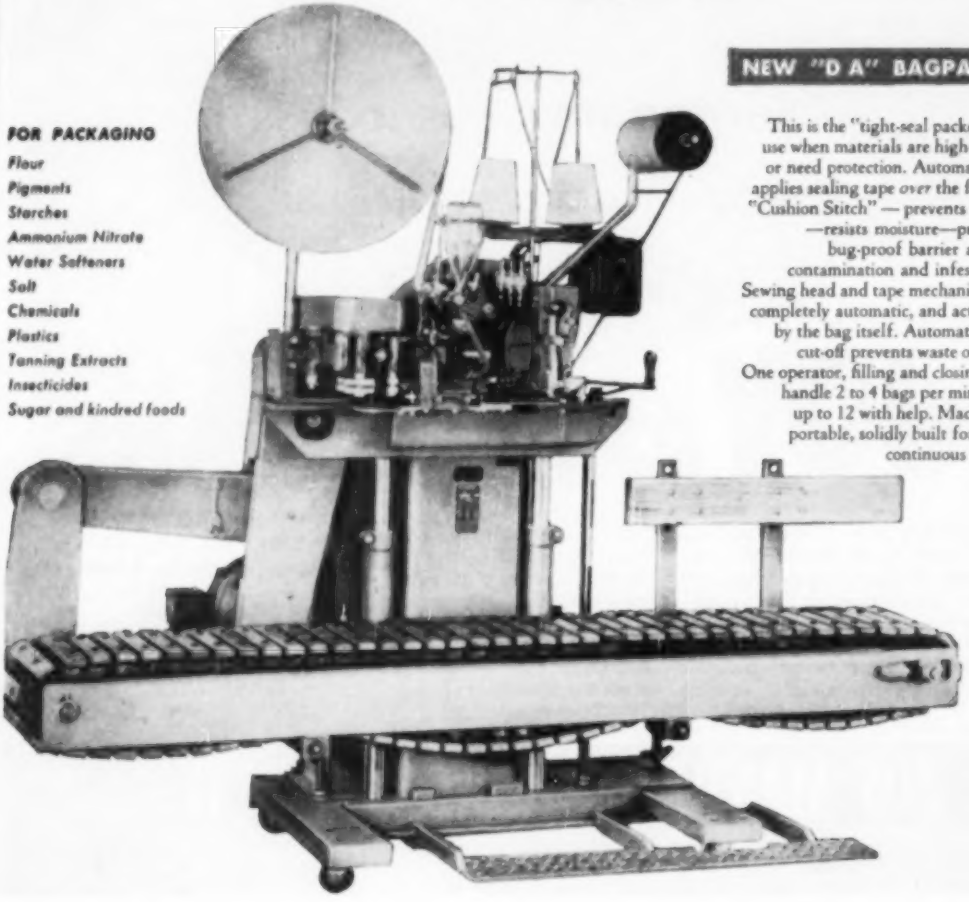

NEW "D A" BAGPAKER

This is the "tight-seal packer" for use when materials are high-priced or need protection. Automatically applies sealing tape *over* the famous "Cushion Stitch" — prevents sifting —resists moisture—provides bug-proof barrier against contamination and infestation. Sewing head and tape mechanism are completely automatic, and activated by the bag itself. Automatic tape cut-off prevents waste of tape. One operator, filling and closing, can handle 2 to 4 bags per minute—up to 12 with help. Machine is portable, solidly built for hard, continuous usage.

how TO DESIGN AND SERVICE BAG PACKING MACHINES

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FT Bagpaker, without conveyor, available for use with existing conveyor systems.

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Do YOUR piping systems include valve-killing services that build up excessive maintenance and replacement costs? If so, the new Jenkins Fig. 976-A Plug Type Bronze Globe Valve will produce important savings for you.

Install it where "wire drawing", due to close control of steam, knocks out other valves quickly—where entrapped chips, rust, or scale score the seats and start leaks. See how it defeats the worst valve enemies . . . how it sets new records for endurance and economy.

HERE'S WHY

The stout "heart" of the Fig. 976-A is the stainless steel plug and seat ring, *hard enough* (500 Brinell) to smash steel pipe chips without scoring, yet *tough enough* to take a nine ton load without cracking. Other features are . . .

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B **NEW "TUFFARD" SPINDLE**—Aluminum bronze (tensile strength exceeds 65,000 lbs.)—tough to take stresses, yet hard for long wear. Bigger in diameter, with more strong threads.

C **NEW SLIP-ON, STAY-ON PLUG**—Simple design with T-slot for engaging spindle head is stronger, trouble-free, and permits free flow. Mirror-finished bevel assures perfect mating with seat ring.

D **NEW STURDY LUGS**—Flat-faced, V-shaped lugs on union bonnet ring and body ends, permit firm fit and grip of open end, pipe or monkey wrench—withstand repeated disassembly.

A
B
C
D
500 BRINELL ARMOR SEAT Plug and Seat Ring of Jenkins JX-500 special alloy stainless steel — heat treated to 500 Brinell hardness and extraordinary ductility—lapped together to a mirror finish. Unaffected by throttled steam, resists galling, erosion, corrosion.

Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros. Ltd., Montreal.

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JENKINS BROS., 80 White St., New York 13, N.Y.

Please send Armor Seat Valve Folder—Form 193.

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Company_____

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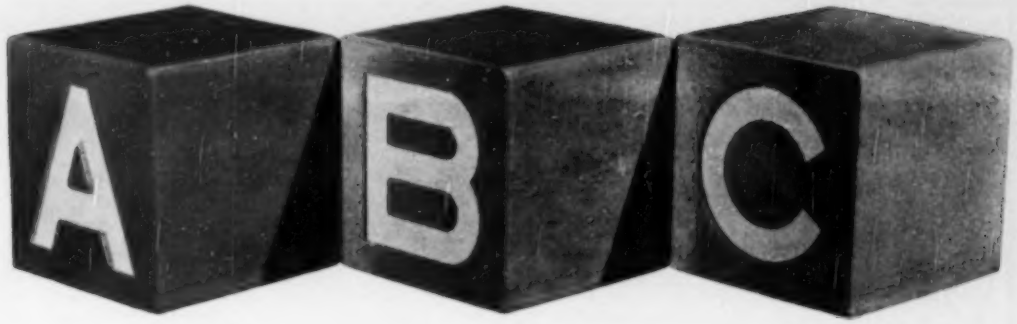
JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need



"Building Blocks" for sale

Not for your youngster but for you are these chemical building blocks —specifically, olefins and paraffins. These chemicals are intermediates in the production of many chemicals including alkyl phenols, alkyl mercaptans, alcohols, and halogenated products. If you presently produce or are doing research work with any of these end products, you should be interested in Atlantic's materials.

Diisobutylene Approximate composition of 80 weight percent 2,4,4-trimethylpentene-1 and 20 weight percent 2,4,4-trimethylpentene-2. Recent improvements in processing techniques have narrowed the boiling range to 101.8 to 105.0° C. Available in drums and tank cars.

Triisobutylene Principal components consisting of 2,4,4,6,6-pentamethylheptene-1; 2,4,4,6,6-pentamethylheptene-2; 2,2,4,6,6-pentamethylheptene-3; 2-neopentyl-4,4-dimethylpentene-1. Available in drums and tank cars.

Ultrax 20 Water white mixture of predominately straight chain paraffin hydrocarbons averaging 20 carbon atoms per molecule. Available in drums and tank cars.

In addition to these commercially available olefins, experimental quantities of hexenes and nonenes can be supplied for research work. We'll be glad to send you our Technical Bulletin giving further information on these Atlantic products. The Atlantic Refining Company, Chemical Products Section, 260 S. Broad St., Philadelphia 1, Pa.

ATLANTIC

PETROLEUM CHEMICALS

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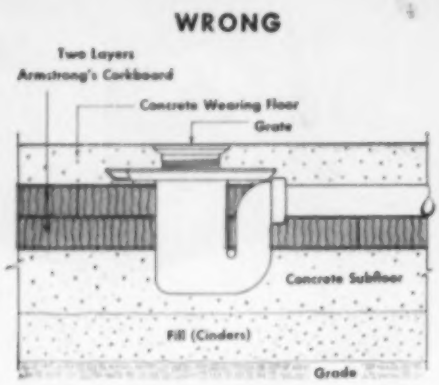
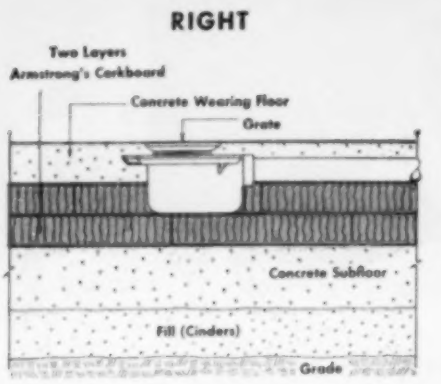


The diagram above shows a common type of floor drain fixture installed. Note that the upper layer of insulation must be cut because of the position of the drain pipe. The insulating envelope must also be pierced to accommodate the tall dimensions of this drain.



This drawing shows how a properly designed cold storage room drain can be installed. The lead-off pipe clears the upper layer of insulation. Because of its squat dimensions, this drain is readily installed without making a complete break in the flooring insulation.

How to install floor drains in refrigerated rooms

When you're planning a low-temperature room, remember that the use of a standard type floor drain results in higher installation costs and weakens the insulation envelope.

In standard drains the outlet leads away from the trap below the wearing floor, making it necessary to tunnel it through the insulation. Labor costs go up, and insulation thickness is reduced at this point. The place where the traps of these drains completely pierce the insulation is a weak spot where trouble may develop.

By choosing drains specially designed for cold rooms, these weaknesses can be corrected. The distance between outlet and base of these drains is shorter than in standard fixtures. Lead-off piping runs in the wearing floor. There's no need to tunnel through the floor insulation and reduce its efficiency. The shallow trap also allows for insulation thickness below its base.

Cold room drains and piping are installed before the last layer of floor insulation is laid. The last layer then is fitted under the drain pipe and around the trap, where it's sealed with hot asphalt. Then the concrete wearing floor is poured flush with the drain grating.

Correct design of a low-temperature room calls for a specialized knowledge of many details that aren't found in ordinary building plans. Armstrong engineers are familiar with these details. When you have a question involving the design of a low-temperature room, take advantage of their specialized knowledge. The complete contract service these men represent also offers you quality insulating materials and skilled mechanics to apply them. Call the Armstrong District Office located nearest you or write today to Armstrong Cork Company, 3304 Concord Street, Lancaster, Pennsylvania.

ARMSTRONG'S INDUSTRIAL INSULATIONS

MATERIALS (A) INSTALLATION

FOR ALL TEMPERATURES FROM 300° F. BELOW ZERO TO 2800° F.

From Nature's Gas Wells to Man Made Storage

With the rapid expansion of natural gas pipe line facilities, many public utilities are considering the use of underground, high pressure storage as the most economical and practical method of maintaining a readily available reserve for use under peak demand conditions or in case of failure of long distance pipe lines. Stone & Webster Engineering Corporation has designed and constructed seven underground gas storage fields which vary in capacity from 1,500,000 cubic ft. to 120,000,000 cubic ft.

STONE & WEBSTER ENGINEERING CORPORATION

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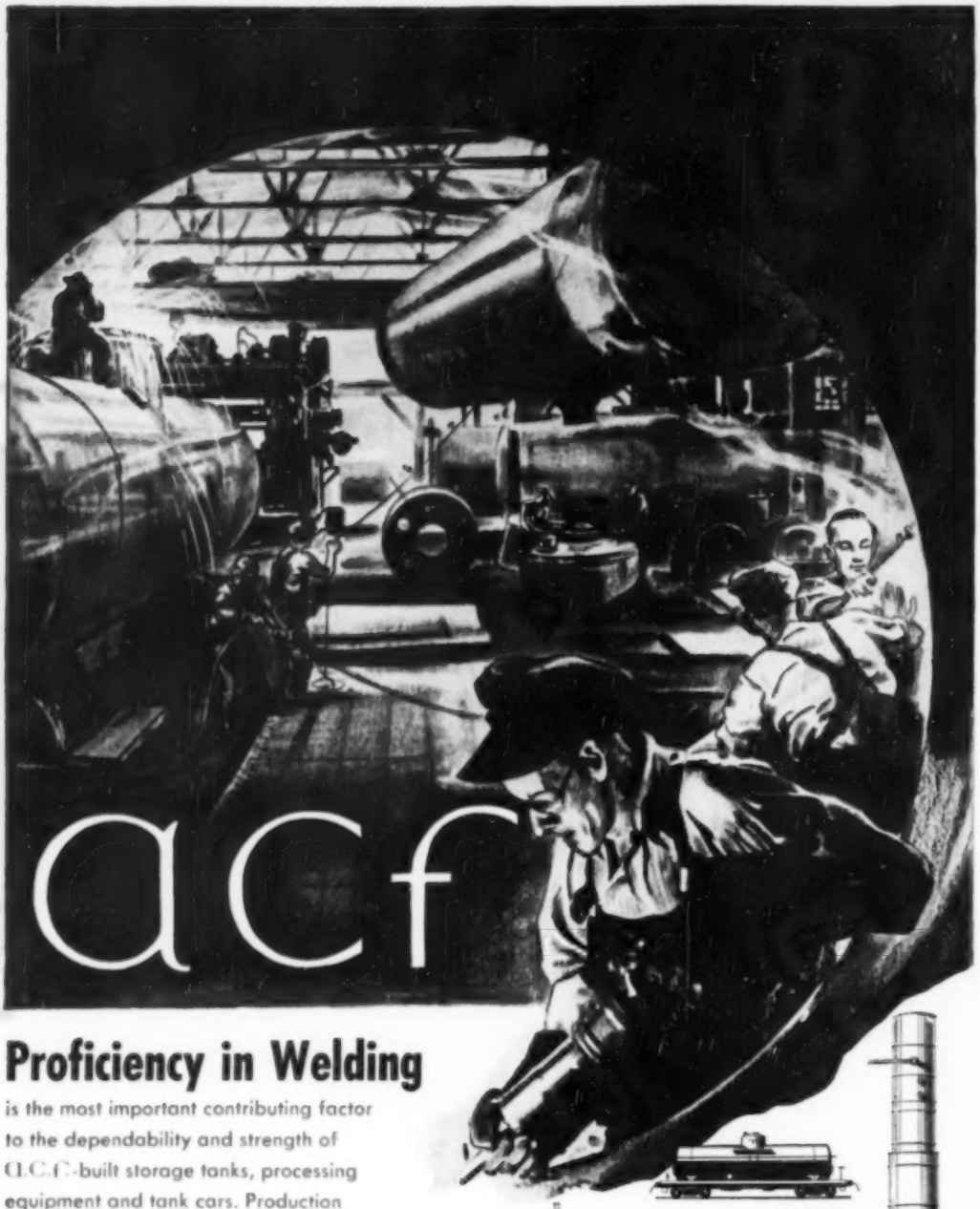

Proficiency in Welding

is the most important contributing factor to the dependability and strength of A.C.F.-built storage tanks, processing equipment and tank cars. Production welding, as developed at A.C.F., is a modern method of fabrication... involving precision fitting, exacting test procedures and x-ray of seams... providing that added measure of safety.

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U.S.I. CHEMICAL NEWS

April ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1950

Dimethyl Phthalate, Popular Plasticizer, Available from U.S.I.

U. S. Industrial Chemicals, Inc., manufacturers of diethyl, dibutyl and diamyl phthalate now have available another excellent plasticizer, dimethyl phthalate. Widely used in the cellulose acetate field, dimethyl phthalate is a colorless, odorless liquid, soluble in all the common organic solvents and oils except petroleum oils. In actual use, dimethyl phthalate is often combined with diethyl phthalate. U.S.I.'s high-purity product is finding wide use in plasticizing cellulose acetate sheeting and film, molding powders, and insulating lacquers.

Specifications

Acidity
Free acid as phthalic, not more than 0.01%

Color
Water-white

Water
None, as shown by the absence of turbidity on separation when admixed with 10 volumes 10° heptane with aromatics not over 5%

Odor
Odorless

Purity
Ester content as dimethyl phthalate, 99—100%

Specific Gravity
At 20°/20°C—1.192—1.194

Trifluoroacetic Anhydride For Direct Esterification

A method of esterification that does away with the necessity of a two-stage process and makes possible a fast direct reaction between acid and hydroxy compound under mild conditions was reported on recently by university researchers. The new esterification process involves the use of trifluoroacetic anhydride and is described as giving yields of 60 to 90%.

Suitable for Self-Esterification of Hydroxy Acids to Yield Polyesters

Customary procedure in the past for synthesizing esters from carboxylic acids and alcohols or phenols was to treat the reactants for several hours in the presence of a strong mineral acid catalyst or to proceed by way of the acid chloride or anhydride. The new method appears to be suitable for self-esterification of hydroxy acids to yield polyesters.

New Assay for Quinine Is Faster, Simpler

A new spectrophotometric method for determining quinine, described as faster and simpler than the official chloroform extraction-gravimetric method, has been devised. The researcher who developed the assay recommends it for control purposes in analyzing pure solutions of quinine encountered in processing operations or for analyzing intermediate or preliminary samples where official assay procedures do not have to be applied. The scientist states that the spectrophotometric method showed an average deviation of only ±0.4% from the gravimetric as an average of 20 determinations.

U.S.I. Launches 1950 Dairy Insecticide Program

Availability of Pyrenones Has Made Possible Tremendous Expansion in Use of Sprays for Direct Application to Animals

The season when fly control is the dairyman's chief concern is not so many months away, and so U.S.I. is launching its 1950 program to acquaint farmers, agricultural leaders, and insecticide manufacturers with the outstanding control that can be achieved safely with U.S.I. Pyrenones. Widespread concern over the possible misuse of some of the newer toxic insecticides led the Food & Drug Administration in 1949 to announce that the presence of possibly hazardous materials in milk might be cause for confiscation. In 1950 dairymen will be more safety-conscious than ever before.

Pyrenone-type sprays are safe to use directly on dairy cattle. They are non-toxic to warm-blooded animals, will not contaminate milk, meat, or other animal products.

Pyrenones Provide Maximum Safety

Though amazingly effective in controlling dairy insects, Pyrenones are non-toxic to warm-blooded animals. They cannot be stored in butterfat of milk or the fatty tissues of the body. Even ridiculously large doses, fed directly to test animals over a long period, have produced no ill effects. They will not contaminate milk, meat, or other animal products. This safety, coupled with the high insecticidal power of Pyrenones has made it possible to produce livestock sprays that are entirely practical for regular animal application.

Return to Direct Treatment of Animals with Protective Sprays

In the last few years, failure of surface spraying to solve the fly problem has led to a rapid increase in the use of protective sprays for animals. Conventional oil-type sprays and water emulsion sprays have enjoyed come-backs, and the one thing that has made possible this tremendous expansion in the use of livestock sprays has been the availability of Pyrenones.

MORE

Electric Heat for Pipes Proves Cheaper Than Steam

Use of tubular electrical heaters on storage tank pipe lines is reported to have reduced operating costs for a midwest oil company. Lines were formerly heated with steam to reduce viscosity of the stored fluid, but costs were high due to heat loss and uneven heat distribution. Electrical heaters are now clamped to the base of each storage tank and are wound around pipe lines and covered with protective layers of insulation to cut heat loss. Even distribution of heat throughout the pipe line is achieved through thermostatic control, according to the company.

Radioactive Phosphorus Aids in Metal-Spraying

An unusual use for radioactive isotopes is in the application of molten metal to surfaces (as a protective coating) by means of an electric arc pistol. An arc is struck between two metal wires fed into the pistol. The arc's heat melts the metal and a blast of air blows it away in the form of a spray. Ordinary air is not conductive and disrupts the arc. The problem is solved by ionizing air to make it conductive by first passing it over radioactive phosphorus.

Pressure-Welds Metals At Room Temperature

Welding metals by pressure at room temperature is reported possible now. Several types of non-ferrous metals, including aluminum, duralumin, copper, nickel, zinc, silver, and cadmium, can be cold welded by the new process. Its most important application is expected to be for cold welding aluminum. Experimental work on ferrous metals is reported in progress.

Publishes Safety Data On Hydrogen Sulfide

Publication of a chemical safety data sheet on hydrogen sulfide has been announced by a noted chemical association. Designed for use by management, supervisory staffs, and operating personnel, it is said to contain information essential to safe handling and use of hydrogen sulfide in transit, in the plant, and in the laboratory.

New-Type Synthetic Rubber

A new type of high-quality synthetic rubber is being made now from a turpentine derivative, scientists state. Main ingredient of the new elastomer is said to be isoprene.

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April * **U.S.I. CHEMICAL NEWS** * 1950

CONTINUED

U.S.I. Dairy Insecticides

Protect Against Hard-to-Kill Horseflies

Pyrenone-type insecticides protect dairy animals, in the field as well as in the barn, against even the highly resistant horsefly or tabanid. They provide fast knockdown and high kill of horn flies, stable flies, houseflies, and other dairy insects. They are economical—dilutions as high as one part emulsifiable Pyrenone-insecticide to 39 parts water protect animals two weeks under normal conditions against horn flies.

Versatile Pyrenones are popular for insect control in milk rooms and other parts of dairy, farm, or ranch buildings, as well as for spraying cows and other livestock.

Many dairymen prefer Pyrenone-base insecticides because they can be had in oil-spray or emulsion forms, but Pyrenones are also available in wettable powders for those who prefer this form. Pyrenone insecticides can be used in any type of sprayer—hand gun, knapsack, aerosol, power sprayer, or steam vaporizer. They will not clog spray nozzles or corrode metal equipment, are non-staining, and will not harm paint.

Pyrenones' wide-range effectiveness makes them popular with dairymen for controlling a variety of farm, food-storage, and household pests. They are effective against roaches, silverfish, wasps, hornets, spiders, crickets, cheese skippers, ants, fruit flies, confused flour beetles, cadelles, and scorpions.

Precise Color Matching With New Instrument

A new precision color-matching instrument for textile, dye, and other industries is said to employ a combined electronic and optical computing system to simulate the response sensitivity and discrimination of the human eye, without the eye's variation in perception. Described as compact and light in weight, the instrument can be carried anywhere in the plant for on-the-spot sampling. Special preparation of samples is reported unnecessary in most cases since the device handles samples one-half inch in diameter and up.

The color matcher automatically accommodates itself, it is claimed, to the level of illumination of the samples being compared. Its range is said to be such that sensitivity exceeds that of the human eye for variations in brightness of 10,000 to 1, permitting comparison of samples reflecting only 2% to an accuracy of 0.5% of reflected light. The instrument is equipped to evaluate tristimulus color values relative to standard white and has a direct reading scale from 0 to 100%.

The device has an accessory sample viewer so that before actual color measurements are taken samples can be examined to make sure surface conditions and illumination are comparable to visual requirements. The sample viewer is useful in making precise measurements of many types of surface, especially where dark colors are encountered, the makers state.

Low-Cost Arthritis Drug Yields Dramatic Results

A new, cheap treatment for arthritis is said to have produced dramatic results in recent tests. Four patients were given the new treatment — injections of a synthetic adrenal gland hormone and vitamin C — and good results are claimed for three of the four cases. One patient, a fifty-five year old man who had been bedfast for six months is said to have walked ten minutes after his first treatment.

Doctors in charge of the treatments are optimistic but warn that it will probably be at least several months before final results are known. Enough drug for one daily treatment costs about $2, according to the doctors, as compared with a cost of $200 for an eight-day supply of another new arthritis drug, ACTH.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

A new, extremely fast and efficient broiler that makes use of infra-red rays is said to cook steaks in 5 to 7 minutes, to require no preheating, and to be economical. It works on A.C. or D.C., does not smoke or spatter fat, and is easy to clean, the makers state. **(No. 559)**

Continuous indicating and recording of viscosity of hundreds of industrial liquids while under actual processing is reported possible with a new instrument, particularly adaptable to use in the textile, chemical, food, paper, plastics, and protective coatings industries. Viscosity range is reportedly 20 to 100,000 centipoises. **(No. 560)**

A flexible method of supporting lab apparatus is said to permit addition or removal of any supporting rod, either vertical or horizontal without dismantling any other part of the frame. **(No. 561)**

A new-type rubber-to-metal adhesive is claimed to bond natural rubber, GR-S, nitrile rubber, and neoprene to steel, stainless steel, aluminum, zinc, magnesium, brass, and nickel. Bonds reportedly resist aging, solvents and oils, and boiling water. **(No. 562)**

A new goniophotometer, for measuring the manner in which flat specimens reflect and transmit light is said to be the first offered with tristimulus filters for measuring color as a function of illumination and direction of view. **(No. 563)**

A new cold liquid spray for cleaning electric motors, claimed to dissolve grease fast, evaporate quickly, and to be practically inert to ordinary electrical insulation, is easy to handle because of its low flammability and mild toxicity, the makers state. **(No. 564)**

A new antifouling coating for preventing attachment of both sea and fresh water marine grass growths to boat bottoms is described as easy to apply and protects against barnacles, borers, annelids, algae, etc., it is reported. **(No. 565)**

New adducts for rubber, both natural and synthetic, are reported available. They are for use in foam rubber products, rubber-containing adhesives, and such rubber goods as gloves, girdles, hot water bottles, etc. **(No. 566)**

A flexible paint for auto tops is claimed to strengthen and waterproof fabric, stop unraveling, and anchor loose threads. **(No. 567)**

For painting hard-to-brush surfaces a new "electric paint brush" is said to make easier the refinishing of wicker furniture, radiators, and automobiles and the staining of shingles and plywood. The tool can be operated from 110-A.C. electric light sockets and can be used with water- and oil-based liquids. **(No. 568)**

PRODUCTS OF U.S.I.

ALCOHOLS
Amyl Alcohol (Isoamyl Alcohol)
Butanol (Normal-Butyl Alcohol)
Fusel Oil—Refined
Propanol (Normal-Propyl Alcohol)
Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof U.S.P.
Absolute—200 Proof
Solox*—proprietary solvent—regular and anhydrous
ANTI-FREEZES
Sugar Pyro* Anti-Freeze
U.S.I. Permanent Anti-Freeze
ANSOLS
Ansol* M
Ansol* PR
ACETIC ESTERS
Amyl Acetate—Commercial and High Test
Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate
OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate
PHTHALIC ESTERS
Dianyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate
Dioctyl Phthalate
OTHER ESTERS
Diatol*
Diethyl Carbonate
Ethyl Chloroformate
INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate
ETHERS
Ethyl Ether, U.S.P.
Ethyl Ether, Absolute—A.C.S.
ACETONE — A.C.S.
FEED PRODUCTS
Choline Concentrates
Curbay B-G*
DL-Methionine
Riboflavin Concentrates
Special Liquid Curbay*
U.S.I. Animal Protein Factor Supplement
Vacatone* 40
RESINS (Synthetic and Natural)
Arochem*—modified types
Arofene*—pure phenolics
Arotar*—for special flat finishes
Aroplas*—alkyds and allied materials
Congo Gums—raw, fused & esterified
Ester Gums—all types
Natural Resins—all standard grades
INSECTICIDE MATERIALS
CPR Concentrates: Liquid & Dust
Piperonyl Butoxide
Piperonyl Cyclonene
Pyrenone* Concentrates: Liquid & Dust
Pyrethrum Products: Liquid & Dust
Rotenone Products: Liquid & Dust
INSECTIFUGE MATERIALS
Indalone*
Triple-Mix Repellents
OTHER PRODUCTS
Colladions
Ethylene
Nitrocellulose Solutions
P.B.*—Liquid Insulation
Urethan, U.S.P.
Special Chemicals and Solvents

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The *new* Purelube

Pure Oil EXPERIENCE GIVES IT *Quality*

Tri-Sure CLOSURES GIVE IT *Protection*

TO PRODUCE "Purelube", its new premium quality motor oil, the Pure Oil Company built a multi-million dollar plant near Beaumont, Texas, embodying the most advanced refining facilities.

And to give "Purelube" quality the finest *protection* in transit — protection from leakage, seepage, pilferage and substitution — every drum is equipped with Tri-Sure Closures*.

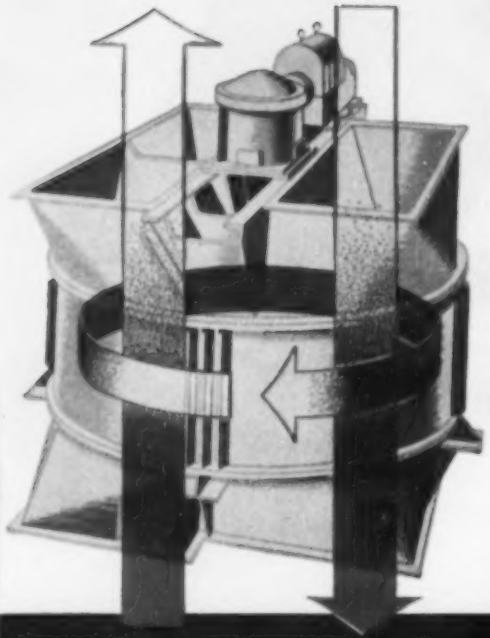
Just as Pure Oil's years of refining experience are applied to the development of every product, Pure Oil's long experience with Tri-Sure Closures — going back to 1936 — has established its policy of *Tri-Sure protection* for every drum.

The experience of America's leading petroleum and chemical companies will confirm *your* judgment in giving *your* product the protection of the Tri-Sure Flange, Plug and Seal. On your next drum order, *play safe* with your product and reputation by specifying "equipped with Tri-Sure Closures".

Tri-Sure
CLOSURES

*The "Tri-Sure" Trademark is a mark of reliability backed by 27 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA



this preheater is cutting fuel costs in hundreds of plants

the *Ljungstrom* AIR PREHEATER

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

The Ljungstrom air preheater has proved its value in industrial and utility plants throughout the country. That is why every year a constantly increasing percentage of the installed boiler capacity is equipped with Ljungstrom air preheaters.

Your fuel costs will be lower too, when your boiler is equipped with the Ljungstrom air preheater. The regenerative design of the Ljungstrom permits reliable operation at low exit gas temperatures. This assures the greatest possible heat recovery . . . reduces the amount of fuel required.

If you are planning a new installation, or expanding your present one, our engineers will welcome the opportunity to show you how the Ljungstrom can raise the overall efficiency of *your* plant.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

no need to look further for **synthetic detergents**

SUPERIOR SYNTHETIC DETERGENT MATERIALS ARE AVAILABLE FROM ORONITE IN THESE THREE FORMS:

1. **DETERGENT ALKANE** For detergent or chemical manufacturers who have suitable sulfonating and processing equipment, Oronite Alkane is unique in type, quality and economy. A water-white, wholly synthetic alkyl aryl hydrocarbon, it is eminently suitable for making detergents and wetting agents of the highest quality.

2. **DETERGENT SLURRY** For detergent processors and manufacturers with blending and drying equipment. Detergent Slurry is an alkyl aryl sulfonate in paste form, easily blended for producing quality detergents.

3. **DRY DETERGENTS** Alkyl aryl sulfonates in dry form. Near white color—available in 3 particle sizes, readily adaptable to compounding and repackaging operations.

Detergents from Oronite Alkane, in addition to providing unexcelled cleaning action are: superior emulsifiers of fats and greases; stable and effective in strong acid and alkali solutions; effective as reducers of surface and interficial tension even in low concentrations. For complete detailed information, write the Oronite office nearest you.

OTHER ORONITE PRODUCTS:

Polybutenes • Cresylic Acids
Naphthenic Acids
Sodium Sulfonates
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Phthalic Anhydride
Gas Odorants
Wetting Agents
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THE NAME TO WATCH IN CHEMICALS

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TRENTWELD TUBING

helps ROSS cut costs

Cutaway showing TRENTWELD Tubing in Ross "SSCF" Exchanger

The new Ross "SSCF" Exchanger, engineered and manufactured by Ross Heater and Mfg. Company, Inc., Buffalo, N. Y. is a low-cost, all stainless steel, exchanger. It is significant that in this interesting development TRENTWELD was included among the important components: TRENTWELD Large Diameter Tubing forms the shell, while the condenser tubes are TRENTWELD Full Finished.

More and more manufacturers are looking to TRENTWELD for the answer to their stainless steel tubing application problems. That's because TRENTWELD is made in a *tube* mill by *tube* engineers . . . who roll and weld stainless and high alloy tubing exclusively.

Our staff of metallurgists and engineers can help you apply stainless steel tubing to your equipment—better! Try TRENTWELD! One call from you puts our years of experience at your call.

TRENT TUBE COMPANY
subsidiary of Crucible Steel Company of America
General offices and plant: East Troy, Wisconsin
Sales office: Chicago — 4501 West Cortland
New York — Chrysler Building

TRENTWELD

STAINLESS STEEL TUBING

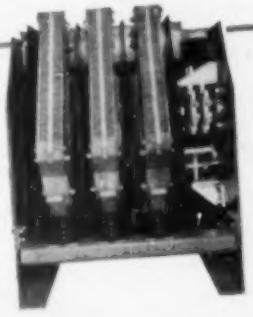
NOW! 5000V in 34"

NEW SMALLER G-E LIMITAMP AIR-BREAK CONTROLLER

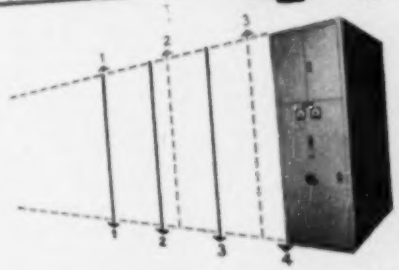
Only 34 inches wide—including enclosure—as contrasted to the previous 52, yet capable of controlling 840 more volts—that's modern design exemplified in this new high-voltage control for motors up to 1250 horsepower.

G-E developed EJ-2 fuses, providing quiet, fast-acting short-circuit protection are enclosed in a compartmented steel cabinet with the new, low-inertia air-break contactor. All the control you need for motors (even those on rapid duty cycle) is engineered, assembled, and tested in our factories to save you layout, installation, operation, and maintenance costs.

Write for more information in Bulletin GEA-5409. This includes descriptions of oil-immersed Limitamp control, reduced-voltage, two-speed, and reversing forms as well as the new full-voltage air-break controller. ***Apparatus Dept., General Electric Co., Schenectady 5, N. Y.***



MORE VOLTAGE New air-break design increases the maximum rating from 4160 to 5000 volts.



LESS SPACE Width of cabinet is reduced, so now, four air-break controllers can occupy the space formerly taken by three.

GENERAL ELECTRIC

3 Benefits of standardizing on Hooker Sulfides

HIGH PURITY

Sodium sulfide (Fe 8 ppm Max.), Sodium Sulfhydrate (Fe 5 ppm Max.), and Sodium Tetrasulfide (other Sodium Salts, 1.0% Max.) exemplify the care Hooker uses in the preparation of these products. This quality enables you to turn out uniformly excellent products at no increase in cost. There is added saving due to the fact that the clean solution of sulfide and sulfhydrate can be used without settling or decanting—a worthwhile time saver—Purity Pays Dividends.

UNIFORM QUALITY

Dependably uniform quality cuts processing costs several ways. It is not necessary to keep a constant check on solution strength. Finished quality is uniform.

Variation in impurities can slow processing time and cause wide variations in quality and may even lead to possible rejection of the finished product. You get more than you pay for when you buy quality.

PROMPT SHIPMENT

Hooker's popularity as a source of sulfides is due in good measure to its painstaking efforts to meet the processing requirements of its customers. Prompt shipment from ample stocks keep customer's inventory requirements to a minimum.

Particular attention is paid to cleanliness of shipping containers to insure that no impurities mar the quality of the finished product.

Your first step to sulfide satisfaction is to write for samples and data sheets. Please make your request on your company letterhead.

SODIUM SULFIDE Na_2S

Mol. Wt. 78.1
M. P. ..... 100°C

Light buff colored solid in flake form. Rapidly soluble in water; slightly soluble in alcohol; insoluble in ether. Also available in solid form.

ANALYSIS

Na_2S ..... 60 to 62%
NaCl ..... 1.5% Max.
Other Na Salts ..... 2.0% Max.
Fe ..... 8 ppm Max.
Cu, Ni, Cr, Mn, Pb ..... 1 ppm Max.
Water of crystallization ..... 35% Min.

USES

In manufacture of dyestuffs, chemical intermediates, paper pulp, soap and rubber, as an ingredient of dye liquor for textile dyeing; boiling out linen; ore flotation and metal refining, in unhairing hides and wool pulling; desulfurizing viscose rayon.

SHIPPING CONTAINERS

Steel drums ..... 90 and 350 lbs. net

SODIUM SULFHYDRATE NaSH
(sodium hydrosulfide)

Mol. Wt. 56.1
M. P. ..... 55°C

Light lemon colored solid in flake form. Completely and rapidly soluble in water, alcohol and ether. Also available as a liquid.

ANALYSIS (*Flakes*)

NaSH ..... 70 to 72%
Na_2S ..... 2.5% Max.
NaCl ..... 0.8% Max.
Na_2SO_3 and $NaHCO_3$ ..... 0.4% Max.
Fe ..... 5 ppm Max.
Cu, Ni, Cr, Mn, Pb. ..... 1 ppm Max.
Water of crystallization ..... 28 to 26%

USES

In preparation of dyestuffs and other organic chemicals such as thioamides, thiourea, thioglycolic acid, thio- and dithio-benzoic acids, sodium thiosulfate, in unhairing hides, in desulfurizing viscose rayon.

SHIPPING CONTAINERS

Flake: Lacquer-lined steel drums ..... 90, 350 lbs. net
Liquid ..... Tank Cars

SODIUM TETRASULFIDE Na_2S_4
(40% solution)

Mol. Wt. 174.23
Melting Range ..... 3.5 to 17°C

It is a clear dark red liquid with an odor of hydrogen sulfide.

ANALYSIS

Na_2S_4 ..... 40.44%
Sulfur 30.27%
Other sodium salts including sodium thiosulfate, sodium carbonate and sodium sulfate ..... 1.0% Max.

USES

Reducing organic nitro bodies; insecticides and fungicides; ore flotation reagent, manufacture of sulfur dyes, preparation of metal sulfide finishes, soaking of hides and skins prior to unhairing.

SHIPPING CONTAINERS

Steel drums 90 and 350 lbs. net and Tank Cars

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

5 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.

New York, New York • Wilmington, California • Tacoma, Washington

HOOKER CHEMICALS

10-377

MONOCHLOROACETIC ACID • ORTHODICHLOROBENZENE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE

Plus Values in B&W Croloy-Clad Plate

PAY DIVIDENDS HERE

- Croloy cladding and base plate are permanently bonded with resistance welds.
- Bond withstands repeated heating and cooling.
- High strength of bond permits direct welding of internal fittings to Croloy lining.
- Uniform clad protection over full plate.
- Full corrosion resistance retained by heat treatment.
- No interface carbon migration between base metal and Croloy lining.
- Fabricates as easily as plain steels, and without special precautions.
- Provides all advantages of solid alloy protection at a great saving in cost.

It will pay you, as it has so many others, to specify Croloy-Clad Plate for any process equipment requiring dependable and lasting protection against corrosive or oxidizing conditions. Send for latest bulletin.

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B&W

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FOR MATERIALS?
. . . reach for your Sweet's
All these manufacturers' catalogs—containing comprehensive information on metals, glass, insulation, refractories, roofing, waterproofing, flooring and paints—are instantly available in Section No. 4 of your Sweet's File for the Process Industries.
The other sections of this Sweet's File contain additional catalogs covering a wide range of equipment—useful and up-to-date information on product forms, characteristics, performance and use.
This grouping of manufacturers' catalogs, in sections according to products or use of products, is made for your convenience, so that you can more readily compare one product with another. Indexes of manufacturers, products and trade names lead you quickly and easily to the catalogs you are looking for.
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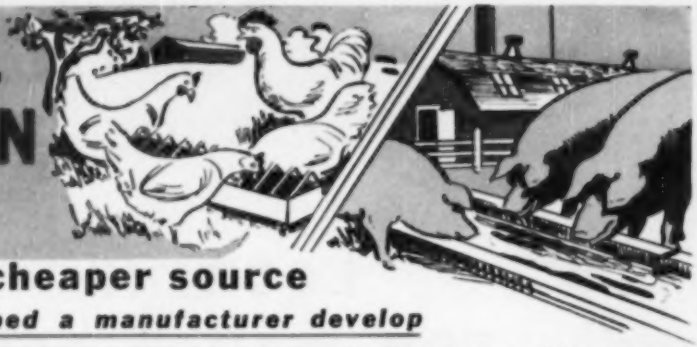
ANIMAL PROTEIN FACTOR



from a new, cheaper source

How Swenson helped a manufacturer develop

an important ingredient for livestock and poultry feeds

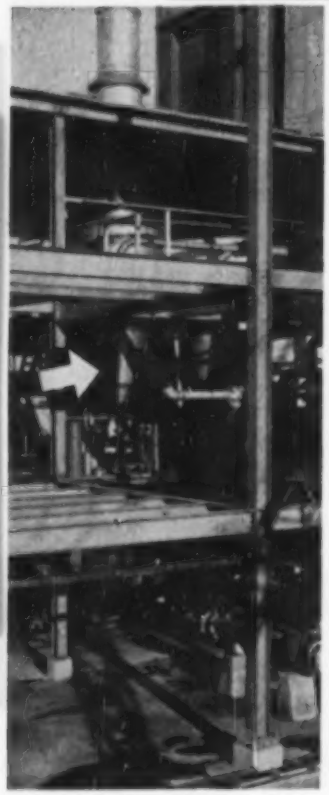
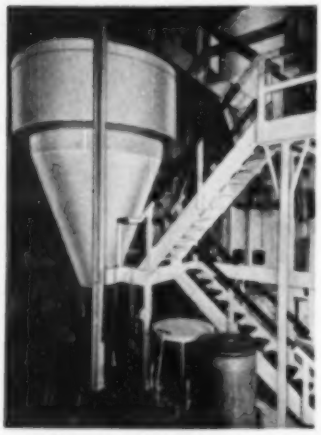


Photo of new Pfizer plant, taken during latter stages of construction. Arrow indicates part of Spray Dryer installation.

Biochemical research demonstrated to Charles Pfizer & Co., Inc., that certain fermentation processes could be utilized to synthesize the valuable Animal Protein Factor. But to market this material it had to be in dry form.

Test runs of the liquid in Swenson's commercial scale laboratory proved that spray drying could be used successfully—the finished powder retained virtually all of the desirable elements.



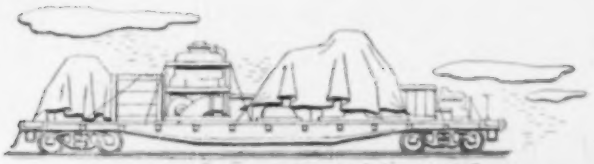
Main drying chamber of a Swenson Spray Dryer used in the manufacture of Upjohn pharmaceutical products.

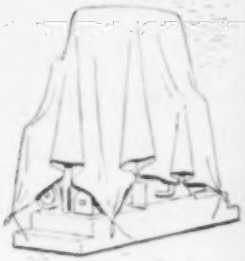
So they installed Swenson Spray Drying Equipment, which is now in regular production. While this equipment was being installed, they made use of Swenson's custom drying service to handle carload lots of the material, thus getting immediate production.

Various other materials are being handled successfully with Swenson Spray Dryers—including substances used for human consumption, such as cascara extract and other pharmaceuticals.

If you have a material which offers unusual drying problems, it will pay you to consult Swenson engineers and make use of their testing facilities.

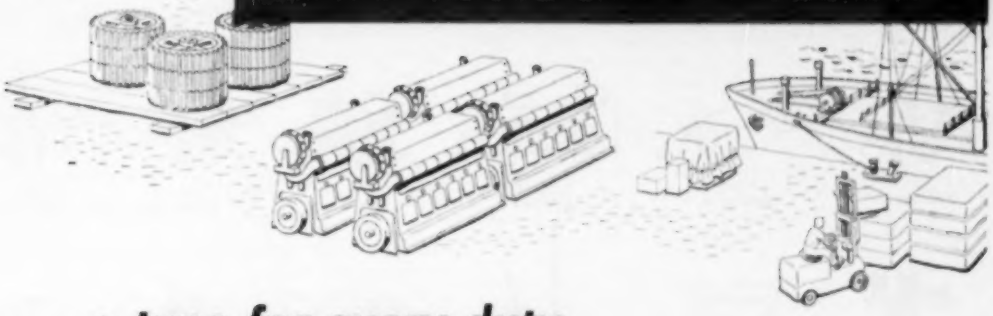
SWENSON EVAPORATOR CO.
DIVISION OF WHITING CORPORATION
15669 Lathrop Avenue Harvey, Illinois
Eastern Sales Office and Export Department: 30 Church Street, New York 7, N. Y.
In Canada: Whiting Corporation (Canada) Ltd., 47-49 LaPlante Ave., Toronto 3





Gulf offers a complete line of

Quality Rust Preventives



. . . a type for every duty,

protection against all exposures

FROM the complete Gulf line of quality rust preventives, you can select the proper coatings to fit the desired methods of application, types of metal, length of time for which protection is required, conditions of storage or shipment, and ease of removal.

Gulf makes available both oil- and petrolatum-type rust preventives for both interior and exterior use—including the well known Gulf No-Rust C (polar type) which displaces residual moisture on metal surfaces and lays down a protective coating; and Gulf No-Rust Engine Oils, which prevent corrosion caused by products of combustion left in internal combustion engines.

A Gulf Lubrication Engineer will be glad to co-operate with you in the solution of your corrosion problems. Write, wire, or phone today.

Gulf Oil Corporation · Gulf Refining Company
GULF BUILDING, PITTSBURGH, PA.
Sales Offices - Warehouses
Located in principal cities and towns throughout Gulf's marketing territory

GULF INDUSTRIAL LUBRICATION

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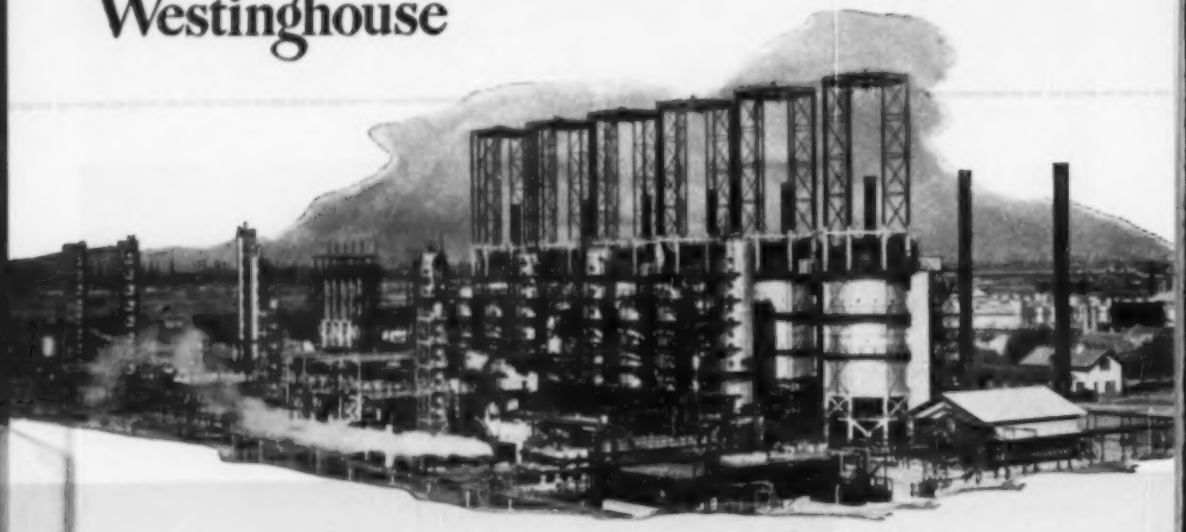
Please send me, without obligation, a copy of your pamphlet "Gulf Rust Preventives."

Name.....
Company.....
Title.....
Address.....

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



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Industrial Lighting

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Oil Immersed Pushbuttons

Oil Immersed Panelboards

Westinghouse

Unit Responsibility

CUTS CHEMICAL POWER COSTS

The manufacturer of your steam and electrical equipment plays a vital role in providing the most efficient power system for your chemical processes. In serving you, that manufacturer should be capable of:

1. Providing the complete line of power equipment your process may require.

2. Furnishing you co-ordinated engineering and supervision of installation.

3. Giving you the benefit of years of experience in the application of power equipment in the Chemical Industry.

These elements of unit responsibility add up to a reduction in costs. You get them all from Westinghouse.

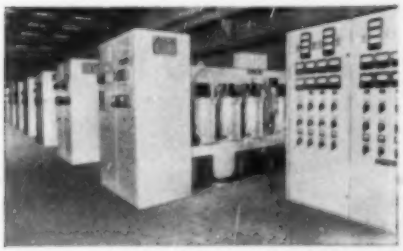
Generation: Westinghouse gives you the complete installation for producing power, plus help in working out your electrical and steam requirements for the most efficient possible plant balance.

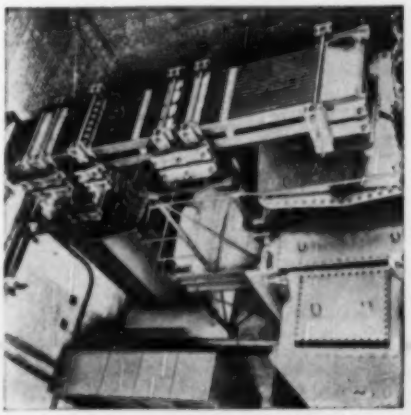
Distribution: Westinghouse makes a correlated line of distribution apparatus, ranging from the smallest arrester to the world's largest substation. All indoor and outdoor enclosures are Bonderized to resist corrosion, and outdoor switchgear is additionally protected by all-weather undersurface coating.

Utilization: Westinghouse makes a full line of mechanical drive turbines and chemical motors, ranging from small, explosion-proof, fan-cooled, Life-Line motors to the largest explosion-resisting, inert-gas-filled, squirrel-cage type motors ever built. A complete line of Westinghouse control, including corrosion-proof or explosion-proof types where needed, is also available to meet the rigid requirements of chemical plant service.

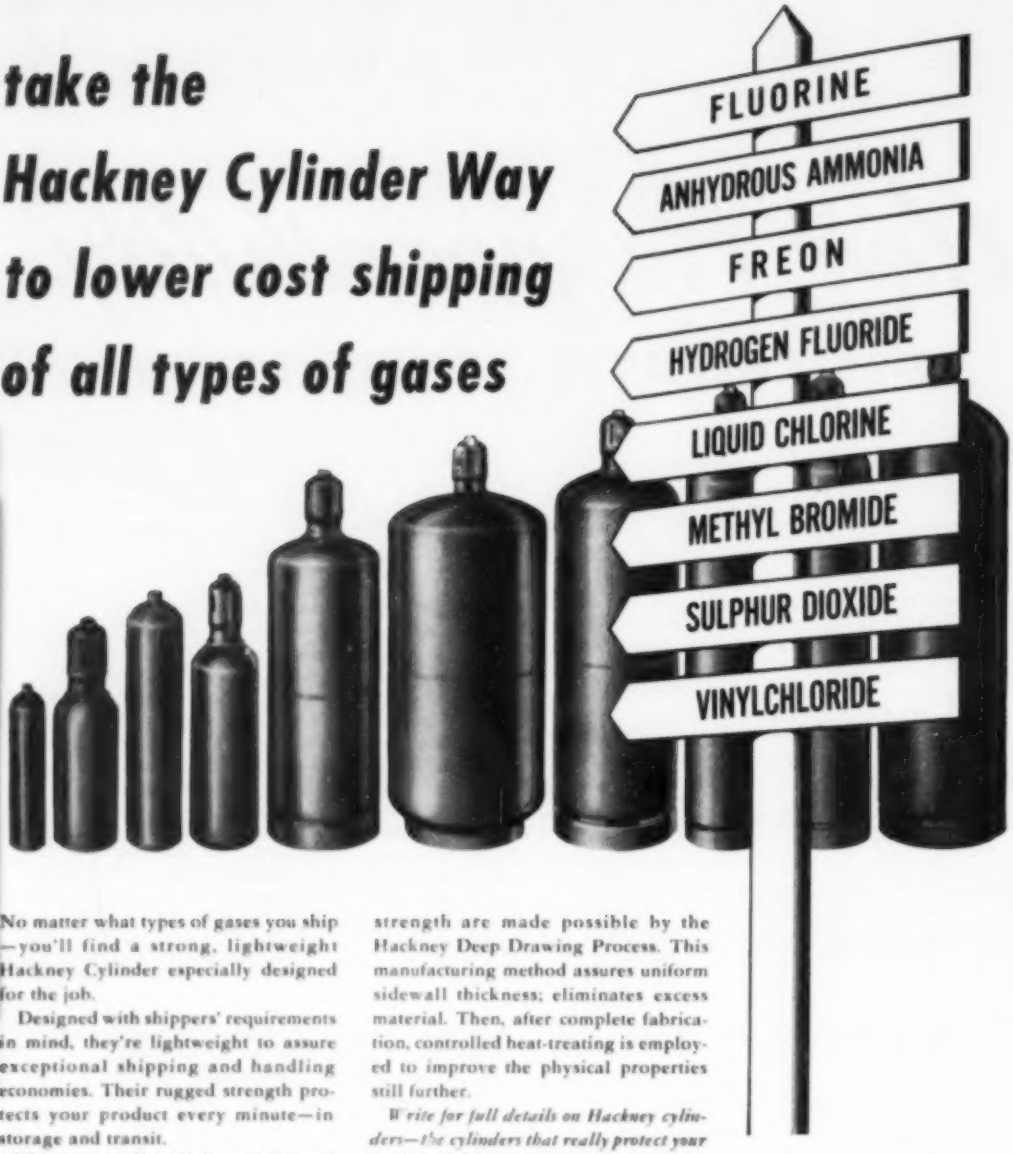
Give us an opportunity to assume this unit responsibility and help you find the solution to your chemical power problems. Call your nearest Westinghouse office, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94804

(Below) Westinghouse Ignitron Rectifiers provide large blocks of rectified power. They carry heavy loads continuously, at full capacity, with safety and at low maintenance cost. **(Right)** Without this 40,000-ampere-series resonance furnace circuit, developed by Westinghouse, the power factor would have been 30%. In this chemical plant installation, use of the series transformer reduced installation cost and raised power factor to unity.





take the Hackney Cylinder Way to lower cost shipping of all types of gases



No matter what types of gases you ship—you'll find a strong, lightweight Hackney Cylinder especially designed for the job.

Designed with shippers' requirements in mind, they're lightweight to assure exceptional shipping and handling economies. Their rugged strength protects your product every minute—in storage and transit.

This outstanding light weight and strength are made possible by the Hackney Deep Drawing Process. This manufacturing method assures uniform sidewall thickness; eliminates excess material. Then, after complete fabrication, controlled heat-treating is employed to improve the physical properties still further.

Write for full details on Hackney cylinders—the cylinders that really protect your product and lower your cost doing it.

PRESSED STEEL TANK COMPANY

Manufacturers of Hackney Products

Main office and Plant: 1447 South 66th Street, Milwaukee 14, Wisconsin
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Hackney MILWAUKEE

CONTAINERS FOR GASES, LIQUIDS AND SOLIDS

MEET YOUR REQUIREMENTS?

We know that's difficult to determine without knowing more about the equipment—the operating characteristics, in addition, the sizes and types available and similar data.

It is for that reason that we stress the availability of our complete engineering and manufacturing service and point out to you that our experienced engineers may help solve your problem just as they did for . . .

. . . a power engineer who wanted to reduce the pressure and desuperheat the steam from a high pressure steam source for use in low pressure turbines. A *specially engineered* Reducing and Desuperheating Valve, as shown, solved his problem.

. . . a manufacturer of fine tobaccos who wanted to record the rate of flow of tobacco casing for close formula control. Two *standard* Electronic Recording Rotameters, of the type illustrated, helped provide the product consistency he insisted upon.

. . . numerous other manufacturers who found that an SK product, *of standard design or specially engineered*, supplied the answer to their needs.

Why not avail yourself of our engineering experience. Let us help determine how SK equipment can best be applied for you.

Bulletins on all SK products are available upon request.

A. This Tank Type Exchanger is representative of SK's complete line of Oil Coolers and Heaters, Air Coolers, Heat Exchangers and Evaporators.

B. This Electronic Rotameter is one of numerous types and sizes developed by SK since 1931 when we produced the first Rotameter in this country.

C. Standard SK Gear Pumps are available to handle most liquids free from solids in capacities up to 1000 gpm.

D. SK Valves, such as this Bleedor Check Valve, are backed by over 60 years of design and manufacturing experience.

E. Modern industrial usage of the jet dates from 1869 when Dr. Ernest Koerting patented a double tube steam injector. Today, the applications of the jet, one type of which is illustrated, are almost unlimited.

SCHUTTE and KOERTING Company

Manufacturing Engineers

1190 THOMPSON STREET PHILADELPHIA 23, PA.

JET APPARATUS • HEAT TRANSFER EQUIPMENT • STEAMERS • CONDENSERS AND VACUUM PUMPS • GAS SCRUBBING EQUIPMENT • POTAMETERS • FLOW INDICATORS • MOISTURE TRAPS • VALVES • SPRAY NOZZLES AND SPECIAL SPRAY DEVICES • ACCUMULATORS

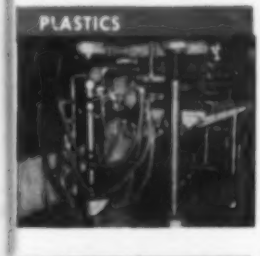
WHAT ARE YOU PAYING *for Condensate?* $ $ $ $

If your steam heated equipment is not supplied with hot, dry steam kept in intimate contact with the heated surface and free from air, you are paying for fuel that is being thrown away every hour.

Worse yet, you are paying double in lost production and rejects, if your equipment is not properly trapped and vented.

$ LOST TIME

Heating up time was reduced from 3 hours to 1 by using Sarco No. 9 Thermostatic Traps on enamel ovens in a large auto body plant. This trap has large air venting capacity. Removes condensate at 10°F below steam temperature.



$ REJECTED GOODS

With seven platens on this large plastics press, the weakest link (one cold section) made rejects frequent and without notice. Now seven Sarco Bucket Traps kick out the condensate and provide trouble-free production. This trap is ideal for releasing condensate as quickly as it forms—a must on plastics presses.

$ LOST FUEL

Most manufacturers don't know how much fuel they are losing due to inefficient trapping. In greenhouses, where fuel is a large part of the cost, monthly fuel bills tell the story fast. This greenhouse saved 30% of the fuel and 60% of the make up water by using Sarco Thermostatic traps on every line and every coil.

FOUR TYPES OF SARCO STEAM TRAPS TO CHOOSE FROM

Sarco makes all accepted types and can fit the trap to the job. Ask for trap selection chart No. 1600.

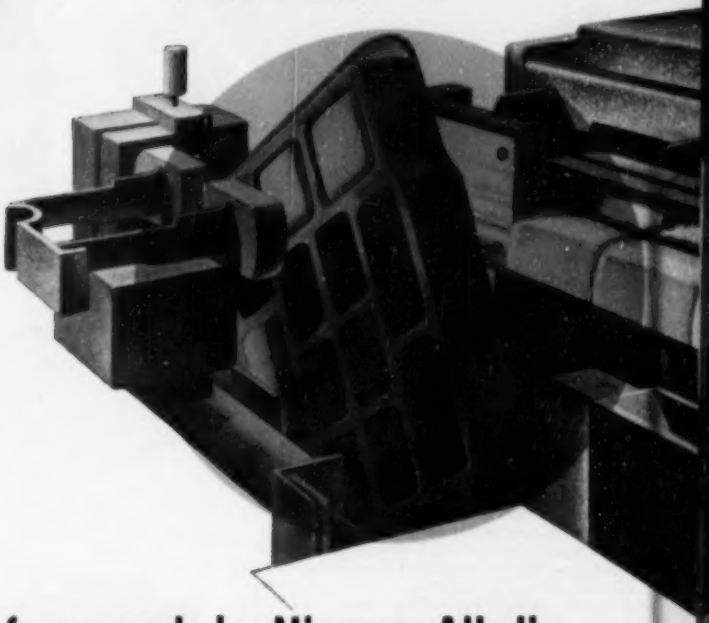
231

SARCO
SAVES STEAM

SARCO COMPANY, INC.
Representatives in Principal Cities
Empire State Building, New York 1, N. Y.
SARCO CANADA, LTD., TORONTO 2, ONTARIO

as you were in 1900

Many soap-making operations were done by hand; so were some of the processes involved in paper, textile and glass manufacturing as well as water purification and sewage treatment.



as you are today

Sanitary, efficient machine operations replace the old hand processes in soap manufacture.

...with 50 years of research by Niagara Alkali

Gigantic kettles four stories deep... capacities as high as 175 tons... these are the superlatives in which soap-makers are planning—and working —today. Every step in soap manufacture is absolutely controlled to assure a uniform and superior product.

Niagara Alkali, now observing its 50th anniversary, is likewise able to assure the uniformity and superiority of its products—the result of continuous research to achieve product control and efficiency. The success of this research is reflected in Niagara's ability to serve many fields well: paper, soap, glass, textiles, sewage treatment, water purification and others.

NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, N. Y.

Liquid Chlorine • Caustic Potash • Carbonate of Potash • Paradichlorobenzene • Caustic Soda
Niagathal (Tetrachloro Phthalic Anhydride) • NIALK TRICHLOREthylene

"HOTTER, SOONER" SAVES YOU MONEY

Yarway Impulse Steam Trap with new stainless steel body.

Yarway Impulse Steam Traps get equipment hot and into production *faster*. Extra profits! Then they keep it *continuously* at peak operating temperatures for maximum production. More extra profits!

What's the reason for *hotter, sooner?* Just this. When steam is turned on, Yarways open wide, discharging the air and condensate *in a hurry*—closing only when steam arrives. Then, when operating temperature has been quickly reached, the little valve (only moving part) literally *floats on the load*... discharging heat-retarding condensate as soon as it forms instead of waiting for quantities to accumulate. Thus equipment is held at peak operating efficiency.

Other economical features of Yarway traps—minimum maintenance, easy installation, low initial cost.

More than 600,000 Yarways have already been installed. Sold by distributors throughout the world.

Try a Yarway today... standardize on Yarways tomorrow.

YARNALL-WARING COMPANY
137 MERMAID AVENUE, PHILA. 18, PA.

Most of Yarway traps installed with Yarway Strainers on cloth dryer. Note small space required.

Stainless Steel Body

YARWAY IMPULSE STEAM TRAP

Cost-conscious contractors and industrialists realize the great installation advantages made possible by Ric-wiL prefabricated 21-foot "straight-run" sections and prefabricated accessory units.

This, however, is only one of the reasons why Ric-wiL is known as "the greatest name in insulated piping systems".

Forty years of experience and production "know-how" go into manufacturing Ric-wiL piping systems for conveying process liquids with the highest thermal and operating efficiency and lowest maintenance cost.

The high-grade materials used in FOIL-CLAD and HEL-COR Insulated Piping provide extreme durability in operation and superior resistance to all types of weathering or corrosive action. Ric-wiL pre-installation engineering eliminates costly cut-fit-and-try methods. Call the nearest Ric-wiL office and our representative will be glad to discuss your specific problem at your convenience.

For full technical information on Ric-wiL Insulated Piping Systems, call or write the Ric-wiL office nearest you or Department 7-U in Cleveland, O.

RIC-WIL
INSULATED PIPING SYSTEMS
THE RIC-WIL COMPANY · CLEVELAND, O.

OVERHEAD UNDERGROUND

FOR FORTY YEARS THE GREATEST NAME IN INSULATED PIPING SYSTEMS

AN IMPORTANT ADVANCEMENT IN PNEUMATIC FLOW CONTROL

HERE'S flow control flexibility . . . one instrument for any application, regardless of flowing medium. The absence of mercury avoids process contamination . . . the Stainless Steel bellows are non-corrosive. In addition, installation is simplified and piping problems are minimized.

The Brown Pneumatic Flow Controller with Barton Meter Body makes an ideal combination . . . adds a new degree of freedom to control of flow and utilization of pneumatic transmission.

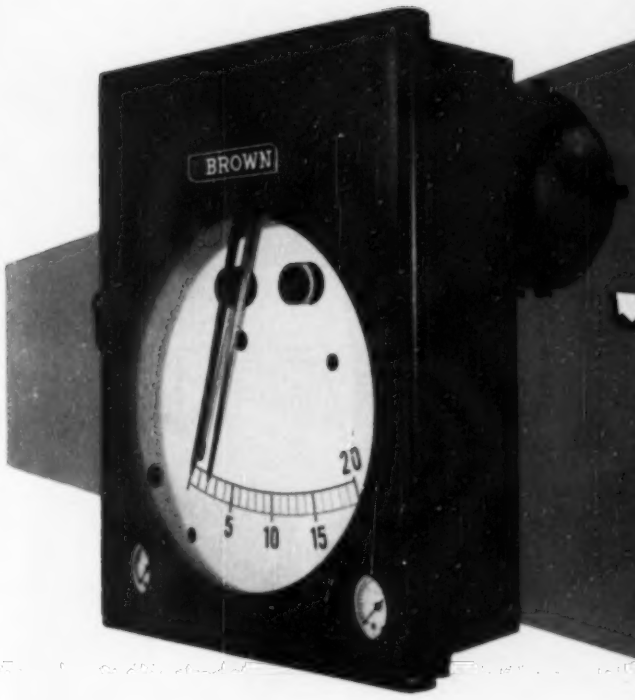
Call in your local Honeywell engineer for a discussion of your applications . . . he is as near as your phone!

COMMERCIAL • RESIDENTIAL • INDUSTRIAL
WORLD'S LARGEST ORGANIZATION FOR ADVANCED INSTRUMENTATION AND CONTROL

MINNEAPOLIS-HONEYWELL REGULATOR CO. • BROWN INSTRUMENTS DIVISION

4478 Wayne Ave., Philadelphia 44, Pa.

Offices in 77 principal cities of the United States, Canada and throughout the world



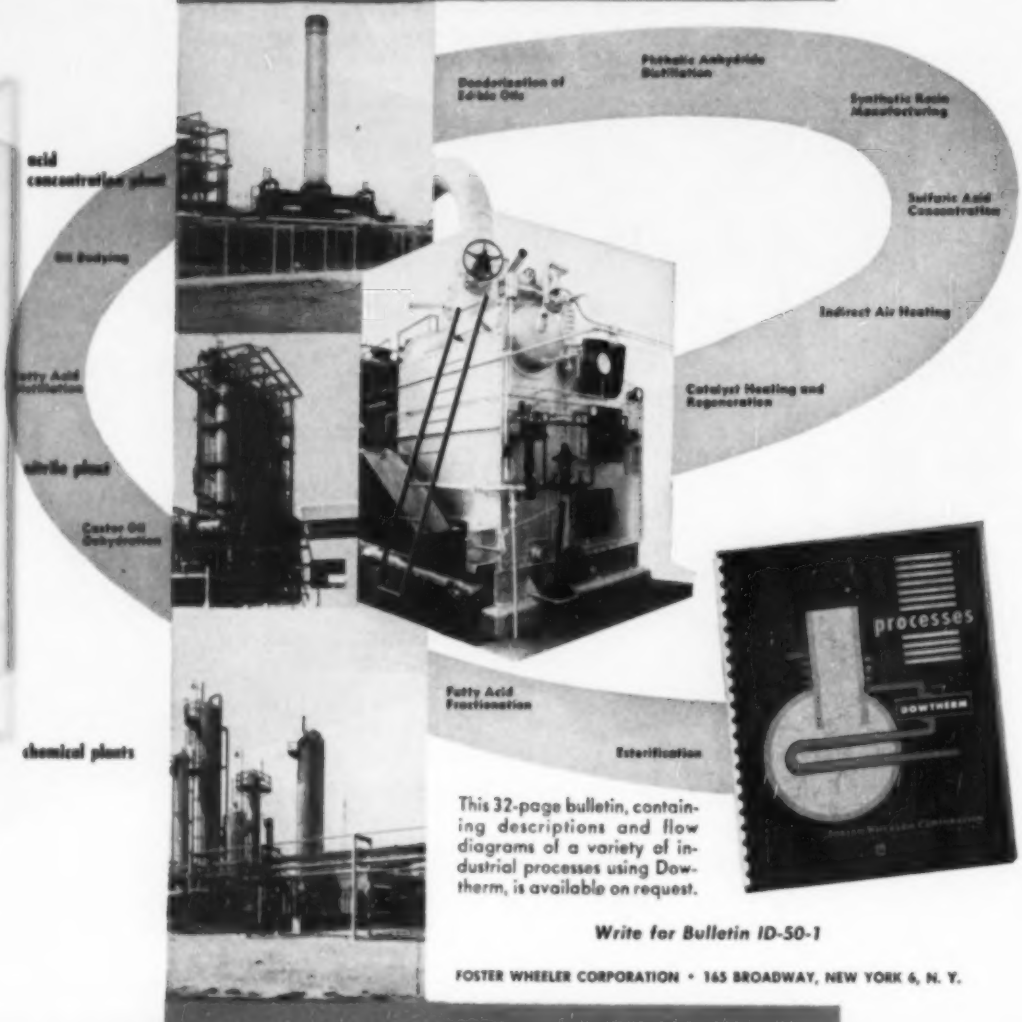
The Brown Pneumatic Flow Controller with Barton Meter Body brings more convenience and less maintenance

Honeywell *Advanced Instrumentation* FOR THE CHEMICAL INDUSTRY BROWN

Monuments of Achievement

Complete plants designed, engineered, and constructed by FOSTER WHEELER

FOSTER WHEELER PROCESS SYSTEMS with *DOWTHERM*

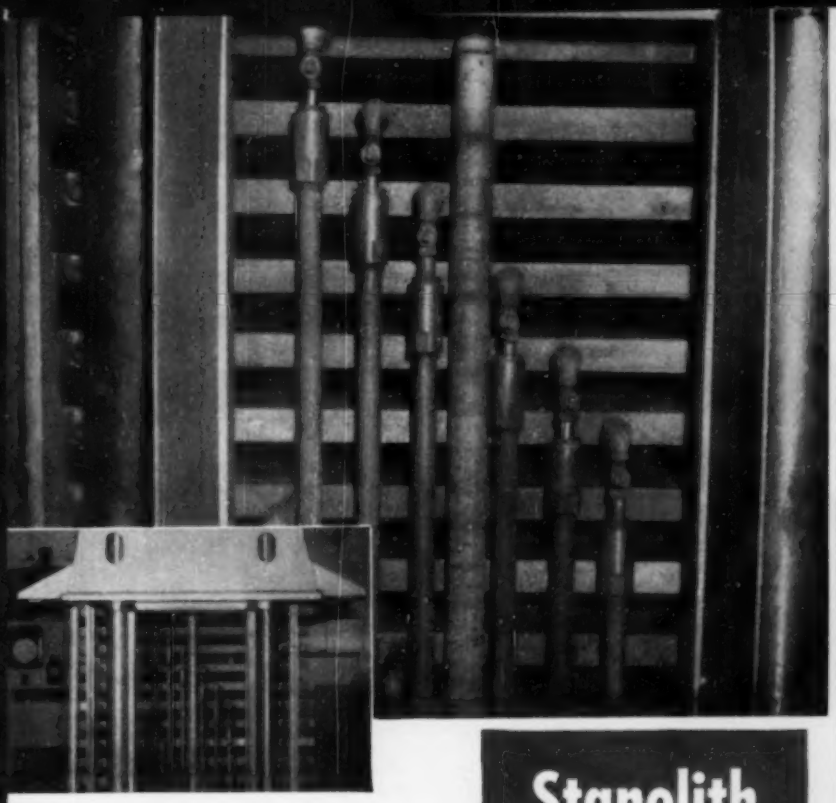


This 32-page bulletin, containing descriptions and flow diagrams of a variety of industrial processes using Dowtherm, is available on request.

Write for Bulletin ID-50-1

FOSTER WHEELER CORPORATION • 165 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER



Stanolith Grease

Stops trouble on steam joints . . .

● Lubrication of the telescopic steam joints on a hot-plate veneer press was a continual problem for a midwest manufacturer. The job required a grease that would withstand temperatures of 240° to 260° F. and the severe washing action of steam and water.

Conventional greases failed to meet these requirements. Joints had to be lubricated frequently. This interfered with production and resulted in excessive consumption of the lubricant.

A Standard Oil lubrication specialist suggested that STANOLITH Grease No. 57 be used. This is a lithium soap product capable of standing up under high temperatures and of resisting the washing action of water. Since the switch to STANOLITH the joints have been lubricated between shifts with no interruption of production. *Lubricant consumption has been reduced 40%.*

Where the combination of heat and water causes lubrication difficulties, try STANOLITH Grease. To help you secure maximum benefits from such products, Standard Oil has a specially trained and experienced lubrication specialist located within easy reach of your plant. How you can take advantage of his services is explained at the right.

Standard Oil Company (Indiana), 910 S. Michigan Avenue, Chicago 80, Illinois.

What's YOUR problem?

D. R. Clay, lubrication specialist at Standard Oil's Grand Rapids office, solved this problem.

He is one of a corps of Standard Oil lubrication specialists located throughout the Midwest to provide "on-the-spot" service to plant operators. One of these lubrication specialists is near your plant. He has plenty of practical experience and has been specially trained for his job in a Standard Oil Lubrication Engineering School. You can obtain his services quickly and easily. Just phone or drop a card to the nearest Standard Oil Company (Indiana) office. Why not arrange, now, to discuss with him the advantages offered by these widely accepted lubricants?

STANOIL Industrial Oils—This multipurpose line of oils provides cleaner operation of hydraulic units, supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

SUPERLA Greases—Available in all consistency grades, SUPERLA Greases cover a wide range of applications. These products are comparable in quality to the highest type of special greases but are as readily available and economical as ordinary cup greases.

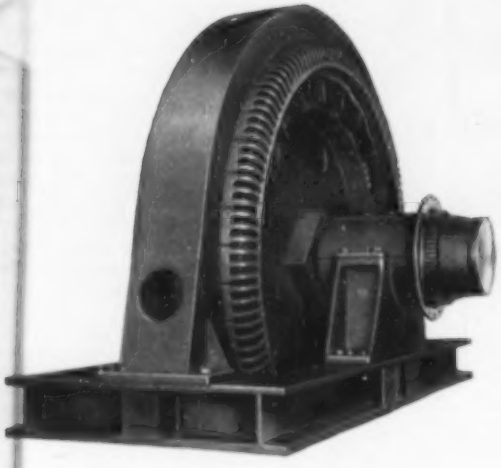
CALUMET Viscous Lubricants—On open gears and wire rope, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears and chains, better internal lubrication of wire rope.

STANORUST Rust Preventives—The eight grades of STANORUST form one of the most complete and effective lines of rust preventives on the market today. Each has been scientifically and specifically developed for its intended use. The grades range from a finger print remover to a heavy petrolatum that protects against corrosion for years under the most severe outdoor exposure.

STANDARD **STANDARD OIL COMPANY (INDIANA)**

Save on original costs

use G-E synchronous

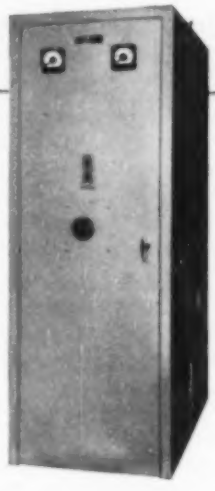


You'll save money in many applications when you specify General Electric synchronous motors. The chart shows (ratings above the black line) the applications where synchronous motors (including control and exciter) have a lower first cost than any other kind of motor. And even in cases where there is no original saving (between red and black lines) you can save on over-all cost by specifying synchronous motors to increase operating efficiency and improve power factor.

When you specify G-E synchronous motors, you get application engineering by experts in the electrical problems of *your* industry. You get the motor that gives you greatest return on your investment.

For your next large, constant-speed motor, ask your General Electric sales representative to tell you how you can take full advantage of the money-saving features of G-E synchronous motors. Or write for bulletins on your letterhead to *Section 770-17, Apparatus Dept., General Electric Co., Schenectady 5, N.Y.*

Low speed..GEA-5332 **High speed..GEA-5426**
Control..GEC-505



PROTECT YOUR SAVINGS WITH G-E SYNCHRONOUS MOTOR CONTROL

New rotor field circuit provides accurate field application—motor is protected against starting shock.

New rotor field circuit keeps constant check on motor performance and, on pull-out, field is removed before first slip cycle is completed—to protect against electrical and mechanical damage.

In addition to the protection offered by the new rotor field circuit, the **new, smaller air-break Limitamp controller** provides fast-acting EJ-2 Fuses that limit short circuits to less than one-half cycle for motors up to 5000 volts.

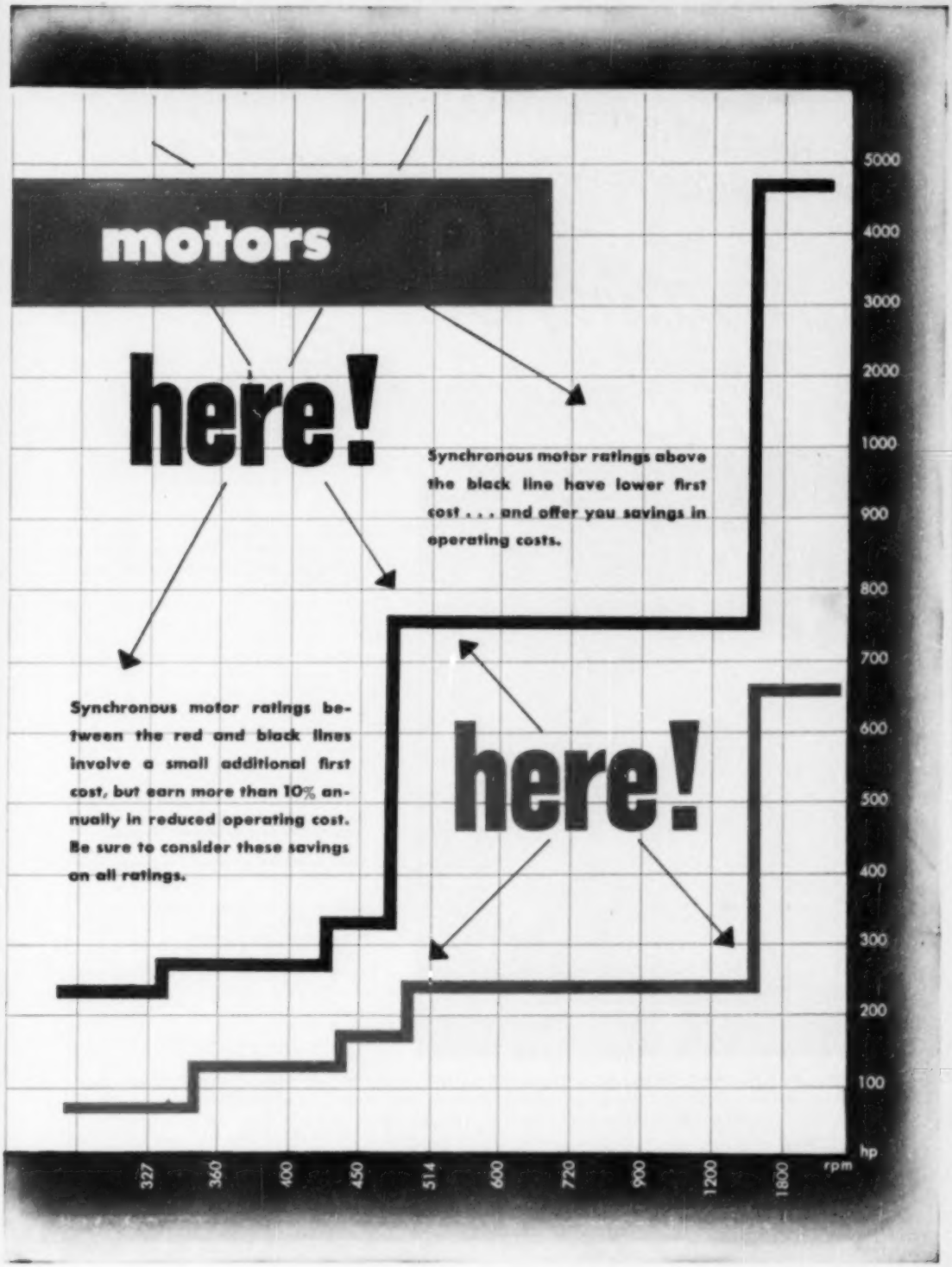
Low-voltage motors (up to 600 volts) are protected by compact, easily inspected air-circuit breakers.

To make it easier to install, to adjust, to operate, and to service, G-E synchronous control is factory-mounted in a steel enclosure with anti-glare meters and all the built-in accessories required for your application.

Come to General Electric for the engineering and manufacturing that will assure you of adequate protection of your motor and plant investment. Write for more information on this precise motor control.

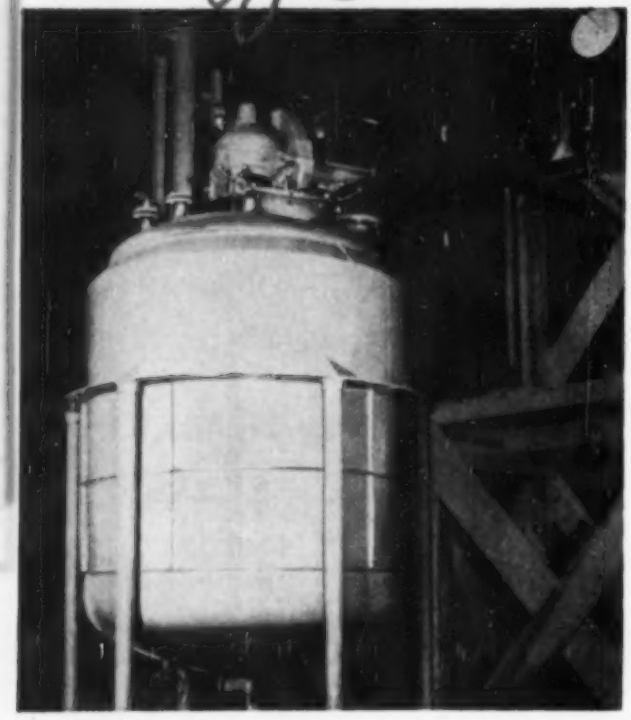
GENERAL ELECTRIC

770-17


motors
here!
Synchronous motor ratings above the black line have lower first cost . . . and offer you savings in operating costs.
Synchronous motor ratings between the red and black lines involve a small additional first cost, but earn more than 10% annually in reduced operating cost. Be sure to consider these savings on all ratings.
here!
5000
4000
3000
2000
1000
900
800
700
600
500
400
300
200
100
hp
327
360
400
450
514
600
720
900
1200
1800
rpm

Resistance to Adherence

—another Cost-cutting Characteristic of Stainless Steel



STAINLESS Steel has built its reputation in the chemical processing industry on its established ability to resist corrosion, resist heat and resist hard usage. But there's another factor of resistance, not so widely recognized but highly important from the standpoint of production economies—resistance to adherence.

Stated simply, this means that certain materials, which during processing have a tendency to cling to common steel (or to the coating with which such steel is protected), *will not stick to Stainless Steel.* Numbered among these materials are food products, gums from rayon and other textile fibers, dyes, wood gums, resins.

As a result of its ability to resist adherence, Stainless Steel equipment makes possible these important savings in time and costs:

Machinery can be kept in operation for much longer periods without cleaning.

Errors in control of process temperatures will result in less damage to equipment.

Spoiled materials can be cleaned or scoured away with less time and labor, and with less damage to equipment.

These advantages, plus the many other cost-saving characteristics of Stainless, you can obtain at their best in U·S·S Stainless Steel—a perfected, service-tested Stainless, uniform in composition, finish and quality.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO · CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO · NATIONAL TUBE COMPANY, PITTSBURGH · TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

UNITED STATES STEEL

New Safety! Greater Economy!

HEINTZ STAINLESS STEEL

CHEM-I-KEG

WEIGHS ONLY 24 POUNDS
***But* HANDLES 15 GALLONS**
Safely!
100 POUNDS *Less* TARE WEIGHT PER ROUND TRIP!

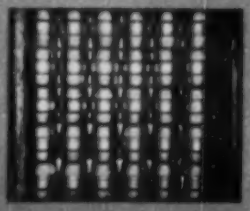
Specifically designed to minimize handling costs . . . drains completely.

Specifically processed from 16 gauge stainless steel for maximum strength . . . maximum safety.

Shipping economy, space-saving stacking, long maintenance-free life, unmatched safety . . . makes Chem-I-Keg tops in economy.

Fully approved by I.C.C.

Now used by leading chemical producers.



- Chime design permits perfect stacking and protects closure. 360 stack in a standard 40 ft. box car.
- This surge-proof pouring spout screws into the closure and permits easy decanting of a small quantity.

Write for descriptive folder.

Steelprest

HEINTZ MANUFACTURING COMPANY
PHILADELPHIA 20, PA.

For Your Information

Every month Monsanto publishes these pages of pertinent information, selected to help you improve your products, lower your production costs, increase your sales . . . Reprints will be sent regularly to you, or other members of your organization, on request.

WOOD, used in construction of this Italian Pergola in world-famous Missouri Botanical Gardens in St. Louis, was treated with a formulation of Monsanto's PENTA-chlorophenol to give it longer life. Wood, including redwood, Douglas fir and cypress, was treated to prevent attack by fungi and insects. And, in this example of Italian art, treated wood had to be paintable.

Look into this New Monsanto Product

Here's a new Monsanto product that may be of use to industry. It is phosphorous acid . . . H_3PO_3 . . . a mild reducing agent. It is a stable, water-white, 70% water solution suitable for the manufacture of a variety of phosphite salts. It is available for immediate shipment in 13-gallon carboys. Send for Monsanto Technical Bulletin No. P-32 and see if this product fits into your production or research picture. The coupon is for your convenience.

How to cut costs without cutting quality of vinyls

The use of Monsanto's HB-40 (partially hydrogenated terphenyl) as an extender plasticizer is a means of cutting costs while maintaining quality. HB-40, extremely low in cost, can be used to replace as much as 50% of the primary plasticizer, based on weight.

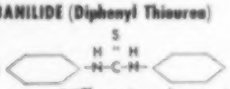
HB-40 is practically water-white for use in transparent or bright-colored products. It is low in toxicity, gives a dry "hand," increased tensile strength, has excellent electrical characteristics and high resistance to moisture. Mail the coupon for details.

Research Chemists' Corner

You may find something new here

Chemists who are looking for ways to improve products or develop new ones, may profit from studying the specifications of Monsanto's thiocarbanilide (diphenyl thiourea) given below. Research in the application of this product is far from exhausted. If you'd like to test thiocarbanilide for its possibilities in your projects, we'll be pleased to send you a sample without cost and without obligating you in any way. Just indicate your wishes on the coupon!

THIOCARBANILIDE (Diphenyl Thiourea)

Structure: 

Moisture:	0.5% maximum (test must avoid decomposing conditions)
Ash:	0.5% maximum
Specific Gravity:	1.32 at 25° C.
Solubility:	Soluble in alcohol. Insoluble in water and many other common solvents.

Two grades are available, one a white powder melting at 148° C. minimum and the other a white-to-grey powder melting at 146° C. minimum.

Reactions: A weak organic base. Boiling with hydrochloric acid results in formation of phenyl isothiocyanate. The sulfur can be removed by PbO in alcohol solution forming carbodiphenylimide or, in the presence of ammonia, diphenylguanidine. Condensation with CS_2 and sulfur under pressure produces 2-mercaptobenzothiazole.

Monsanto Santosite is milder, more economical in semichemical pulping

Santosite* (Monsanto's sodium sulfite anhydrous, technical) is a mild pulping agent for hardwood, mixed wood, flax, hemp, and many cellulose-bearing agricultural residues.

With hardwood of high lignin content and with mixed woods, Santosite delivers a good yield of pulp having relatively long fiber. Because of its mild action, Santosite does not destroy fiber in the process of delignification. Santosite solves the special problems that hamper ordinary methods of pulping hemp and flax. It pulps straw, corn stalks and other agricultural residues to make a variety of quality products.

Santosite is safe and easy to use because it is clean, non-toxic and non-irritating to workmen. Even in small quantities, Santosite is highly efficient. Less time is required for shutdowns to clean up beaters, screens, felts and other equipment. For further details on semichemical pulping with Santosite, mail the coupon or contact the nearest Monsanto Sales Office.

OTHER MONSANTO HEAVY CHEMICALS

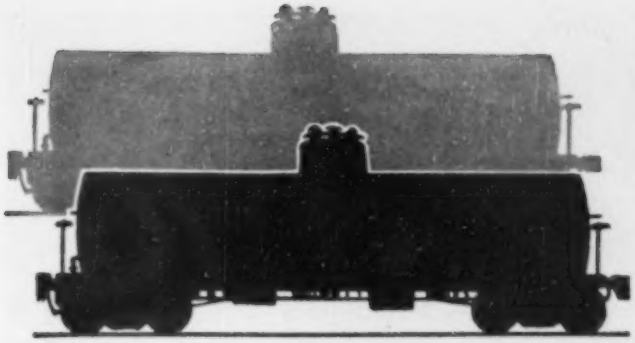
Basic Chrome Sulfate (Santotan*) for tanning industry
Salt Cake (Sodium Sulfate, Technical)
Sulfur Dioxide
Muriatic Acid
Nitric Acid
Sulfuric Acid
Chlorosulfonic Acid

Synergism brings higher detergency

In processes such as textile scouring, where high detergency is desirable, the synergistic action of Santomerse* No. 1 and tetrasodium pyrophosphate (TSPP) pays a bonus.

Synergism, or synergistic action, is the result of two chemicals working together to give detergency higher than the average of the two used separately . . . higher than either used alone.

If detergency is important to you, look into the possibilities of synergistic action of these two Monsanto products. For details, mail the coupon.



Liquid phthalic anhydride available in tank cars

Phthalic anhydride, usually reduced to dry flakes for handling, shipping and storage and changed back to liquid form for processing, is going directly to some Monsanto phthalic users in liquid form.

The liquid phthalic is slightly less expensive due to manufacturing economies. Further savings are effected by users because of reduced handling. Color and quality of the material are unaffected. There is some indication that the elimination of flaking results in a product of improved quality.

Monsanto, with more than 15 years' experience handling and storing liquid phthalic, offers technical information on liquid phthalic handling and storage to firms using this product in appropriate quantities.

At present Monsanto liquid phthalic anhydride is available generally only in tank-car quantities. Shipments are being made to some localities in tank-trucks.

Shoes can turn water but still "breathe"

Men who work outdoors, sportsmen and others who find it necessary to ignore the weather have the promise of good news in shoes. Monsanto's octadecyl isocyanate . . . $CH_3(CH_2)_{16}CH_2NCO$ . . . makes leather water-repellent yet leaves the pores open, so shoes can "breathe." Thus, shoes can afford protection against wet weather without sacrificing comfort.

This may be good business news for you. Octadecyl isocyanate also imparts similar quality to surface coatings, paper and textiles. Perhaps it fits into your production problem. It is a valuable intermediate in hydrophobizing processes. Because of Monsanto's expanded capacity, octadecyl isocyanate is in good supply.

Mail the coupon for a copy of Technical Bulletin No. P-125 which gives you complete details.

Timely Monsanto publications, listed below, will be sent to users of chemicals on request . . . free and without obligation. Indicate the items you want on the coupon.

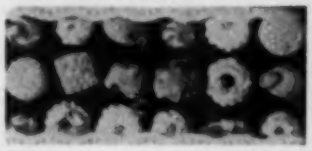
Monsanto Chlorine . . . 20 pages of information, including history, technical data, safe-handling suggestions.

Emulsifiers and Wetting Agents for herbicidal and insecticidal formulations. 12 pages of data on emulsifiers, wetters, solvents, formulations . . . procedures and equipment. (Technical Bulletin P-142.)

Handle Parathion Safely. Illustrated folder for safe handling of parathion by formulators, distributors and users.

Phosphoric Acid. 12 pages of technical data. (Technical Bulletin P-26.)

Aromatic Chemicals Improve Packages



Packages which carry candy, cookies, ice cream and other foods now give extra protection to their contents through the use of Monsanto Ethavan,* vanillin and coumarin. These aromatic Monsanto Chemicals "mask" undesirable odors and tastes which some products pick up from cardboard and paper pulp, allowing products to retain their appealing flavors and aromas.

Paper makers accomplish this "masking" by adding blends of Ethavan and coumarin, or vanillin and coumarin. The chemicals are dissolved in hot water and mixed into the pulp, or flowed on, depending upon the type of paper being produced.

Something to do about mildew

With the arrival of summer's hot, humid weather comes the problem of mildew . . . an expensive problem in many parts of the country. It's one which laundries can solve inexpensively by using Monsanto Biolite in the rinse water before acidic scouring rinse. For further information, mail the coupon.

*Reg. U. S. Pat. Off.

MONSANTO CHEMICAL COMPANY, 1702-D South Second Street, St. Louis 4, Mo. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

MONSANTO
CHEMICALS — PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Send data and quotations on:

☐ Phthalic, ☐ Maleic, ☐ Santosite, ☐ Thiocarbanilide, ☐ H_3PO_4, ☐ Ethavan, ☐ Coumarin, ☐ Ponta, ☐ HB-40, ☐ Biolite, ☐ Santomerse No. 1, ☐ TSPP.

Send literature as indicated:

☐ Monsanto Chlorine, ☐ Emulsifiers and Wetters, ☐ Parathion Safety, ☐ Phosphoric Acid, ☐ Bulletin P-125, ☐ Bulletin P-32.

MONSANTO CHEMICAL COMPANY
1702-D South Second Street
St. Louis 4, Missouri

Please send, without cost or obligation, information as indicated at the left.

Name _____ Title _____

Company _____

Street _____

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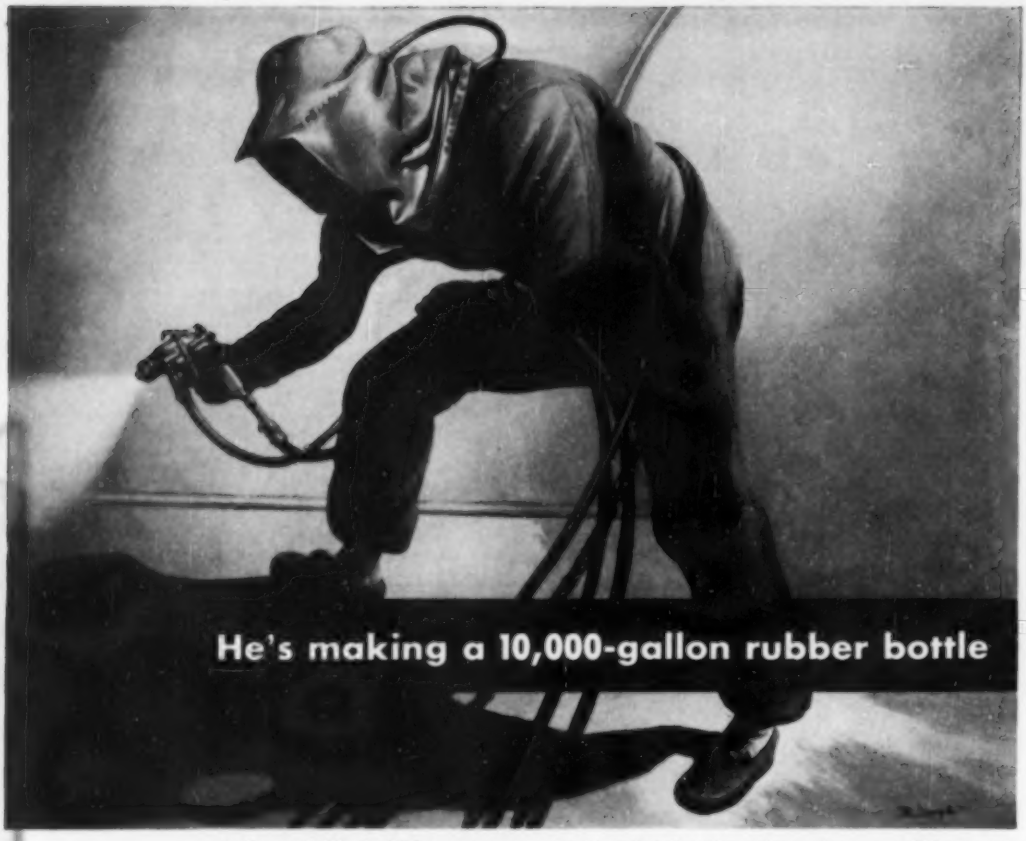

He forms a "rubber bottle" by spraying a coat of "rubber" (M.A.-2) inside a railway tank car—one of 18 operations in the Wyandotte lining process, unique in the industry, for keeping top-purity caustic soda uncontaminated.

"M.A.-2" lined tank cars bring you laboratory reagent grade Caustic Soda

Wyandotte product control doesn't end at the Wyandotte plant. The "M.A.-2" car-lining process—one step of which is shown above—was developed by Wyandotte to protect Caustic Soda from iron pickup in transit.

It is one of the many safeguards which assures you that Wyandotte Caustic Soda, as produced by the Mercury Cell method, is pure upon delivery. This exceptionally high-grade Caustic meets the strictest requirements of the Rayon and Textile Industries. It is ready for use, on arrival, without further processing.

If you would like to know more about modern procedures for analyzing certain alkali chemicals, write for your free copy of the Wyandotte booklet, "Analysis of Caustic Soda, Soda Ash, Bicarbonate of Soda."

Wyandotte Chemicals Corporation
Wyandotte, Mich. • *Offices in Principal Cities*

SODA ASH • CAUSTIC SODA
BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • HYDROGEN • DRY ICE
SYNTHETIC DETERGENTS • GLYCOLS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE
PROPYLENE DICHLORIDE
AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

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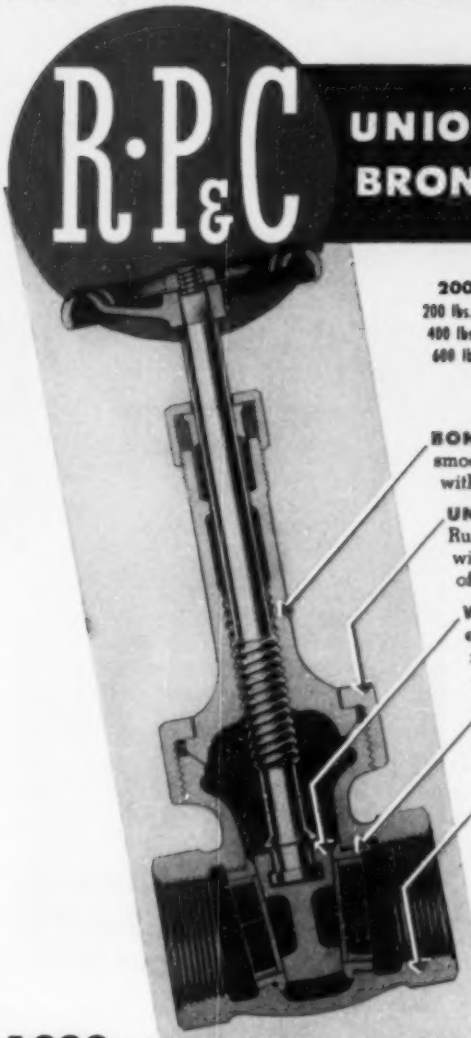
ASK YOUR R·P&C DISTRIBUTOR ABOUT

R·P&C UNION BONNET BRONZE GATE VALVES



200 LB. CLASS	300 LB. CLASS
200 lbs. steam at 500°F.	300 lbs. steam at 550°F.
400 lbs. OWG (non-shock)	600 lbs. OWG (non-shock)
600 lbs. Hydrostatic Test	800 lbs. Hydrostatic Test

Integral Bronze Seats
Nickel Bronze Seat Rings

BONNET P & C High Test Bronze with smoothly machined bevel for tight joint with body.

UNION RINGS P & C Valve Bronze. Rugged. Permits repeated disassembly without distortion of body or weakening of threads.

WEDGE Nickelalloy. Reversible. Milled grooves engage guide ribs in body, reducing seat wear. With valve full open, wedge clears line of flow.

SEAT RINGS Nickel alloy (renewable in sizes 1" and larger) or bronze, integral with body.

BODY P & C High Test Bronze. Heavy end hexes. Heavy section and strong threads at union for long service.

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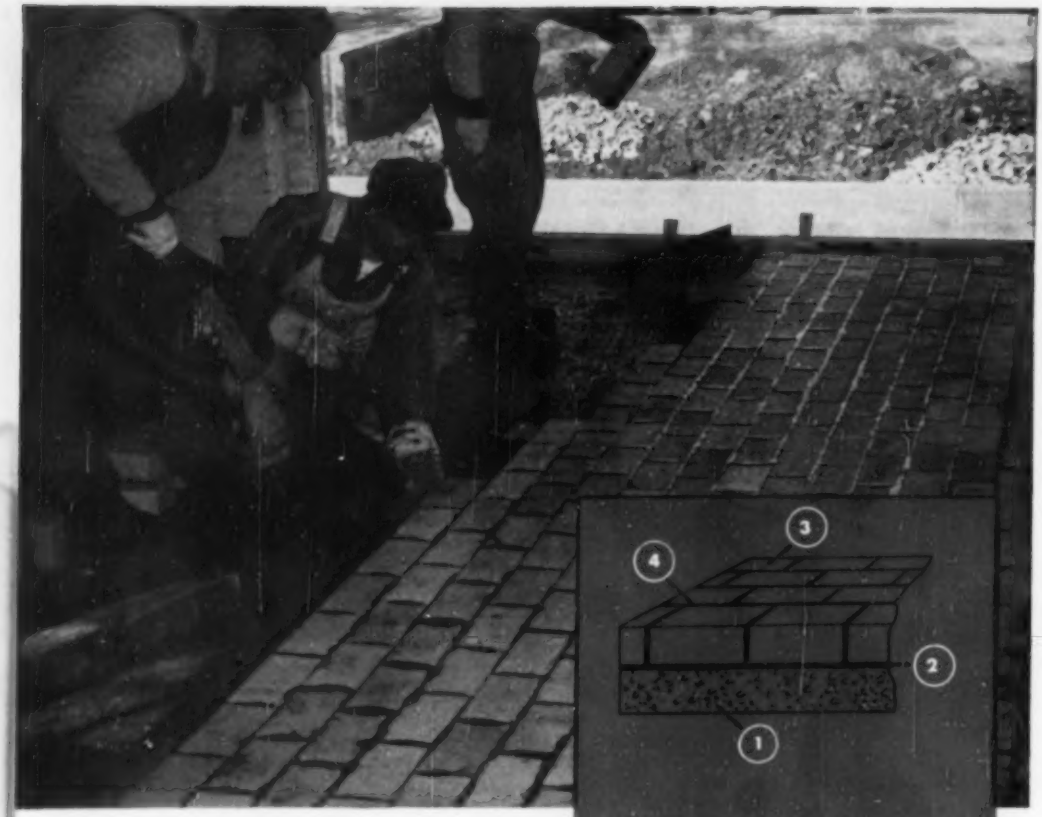
ACCO

Reading, Pa., Atlanta, Baltimore, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

R-P & C VALVE DIVISION
AMERICAN CHAIN & CABLE

READING-PRATT & CADY VALVES



1. Concrete or steel sub-base.
2. "Resilon" membrane forms an impervious barrier between brick and sub-base.
3. Dense, non-porous "Ussco" Acid Brick.
4. Bonded with "Durisite" quick setting acid-and-alkali-resistant cement.

THIS FLOOR WILL HANDLE *Both* ACIDS AND ALKALIES

A "U. S. Specification Floor" such as shown above and sketched at the right will handle *both* acids and alkalies, or acids and alkalies alternately. Strong and weak acids, strong and weak alkalies, oils, solvents, cold water, or live steam leave it unruffled. It will stand up under heavy traffic year after year with negligible maintenance costs.

U. S. STONEWARE

Akron 9, Ohio

Write for your free copy of this big 64-page booklet, "How to Get the Most Out of Corrosion-Proof Masonry." Correct construction procedure; drawings, diagrams, helpful estimating data. Free on request.

THE Chementator

Reg. U. S. Pat. Off.

COMMENTS ON THE NEWS OF CHEMICAL ENGINEERING IN INDUSTRY

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

Rohm & Haas: an acrylate is added

Latest of the acrylate monomers to be made available by Rohm & Haas, which pioneered in this field, is *n*-octyl acrylate, now being turned out in pilot-plant quantities. The polymer of *n*-octyl acrylate has the lowest brittle point of any known acrylate ester; it is of interest in copolymers where low-temperature properties are important. It may also be useful for internally plasticizing polyvinyl chloride and other polymers by copolymerization.

Other acrylate monomers offered by Rohm & Haas include the methyl and ethyl acrylates, now being shipped in tank cars, and the butyl, isobutyl and 2-ethylhexyl acrylates, as well as acrylic acid, all of which can be obtained in pilot-plant quantities. In addition, Rohm & Haas has in commercial production methacrylic acid and a series of methacrylate esters, including the methyl, ethyl, *n*-butyl, *n*-hexyl, *n*-octyl and *n*-lauryl methacrylates.

Since 1936, when Rohm & Haas made its first sales of the monomeric acrylate esters, the market for ethyl and methyl acrylates has steadily expanded, reaching tank-car proportions. Until 1949, Rohm & Haas, with plants at Bristol, Pa., and Knoxville, Tenn., was sole producer of the acrylate esters in the U. S. Since their introduction, the prices of the acrylate monomers have come down from a high of $1.05 to a low of 45c. a lb. Present tank-car prices are 48c. for the ethyl ester and 49c. for the methyl ester. New processes, to be incorporated into added production facilities that are planned, should enable Rohm & Haas to trim further the prices of these monomers, thus opening new markets for them.

Two new fibers from butanediol

Two new synthetic fibers, one a competitor of wool, are under development as a result of the first production in this country of butanediol from acetylene, according to H. B. Hass of General Aniline & Film Corp.

Two companies are working on fibers from butanediol and dibasic acids, each fiber with different textile applications, Hass reports. He declines to say what companies. Like other fibers currently being developed by large chemical companies, one of the new fibers would compete with wool.

Among fibers with wool-like characteristics that have recently been introduced are Union Carbide's Dynel, Du Pont's Orlon, and Terylene, made by Imperial Chemical Industries, Ltd.

ICI: a lion is in the streets

BRITISH LION—Imperial Chemical Industries, Ltd., with 12 operating divisions and close to 100,000 workers in the United Kingdom, is the lion of Britain's chemical industry. And now it wants to get into the U. S., to manufacture its dyestuffs and other synthetic organics here and also to acquire a ready-made marketing organization for its British-made products.

HUNGRY FOR DOLLARS—Ever since the British pound sterling was devalued last September the leonine ICI has been hungry for dollars. Devaluation made ICI prices more competitive and dollar earnings all the more important to stockholders.

HURDLES U. S. BARRIER—So ICI has gathered itself for a leap it has wanted to take for a long time. Just before the British election, ICI offered to buy a controlling interest in Arnold, Hoffman & Co., Inc., of Providence, R. I. This 135-year old firm, with plants at Charlotte, N. C., Cincinnati, Ohio, and Dighton, Mass., turns out dyestuffs, plasticizers, printing gums, sulphonated oils, synthetic resins and wetting agents. Equally significant for ICI, it's an active distributor of chemicals. It is thus that ICI hopes to clear the U. S. tariff barrier.

ICI proposes to pay $55 a share for a minimum of two-thirds or a maximum of 70 percent of the outstanding 93,000 shares of Arnold, Hoffman common. Recently offered in New York at $20 a share, the stock has a par value of $10.

To finance the deal, ICI will borrow up to $3.5 million from Manhattan's Guaranty Trust Co. The loan will be repaid out of Arnold, Hoffman earnings. Hence there is no drain on Britain's scarce dollars.

Besides handling dyestuffs and other products, Arnold, Hoffman is to employ ICI manufacturing processes, getting patents and know-how in return for royalties.

ELUDING HUNTERS—Of some in the U. S., the ICI lion, wise in the ways of the anti-trust jungle,

(*Continued*)

is wary but unafraid; among its peers, however, it is eager for a test of strength. When it came under fire from the U. S. Department of Justice, currently bringing suit against ICI and Du Pont, ICI ended its patent agreement with Du Pont. That's one big reason why the British firm is so eager now to get into the U. S. market.

This agreement began with Nobel Industries before the formation of ICI in 1926. Under it, ICI got, among other things, nylon, while Du Pont got polyethylene. It was formally junked in 1948.

Du Pont is ready for the big British cat. In Wilmington, a Du Pont spokesman said: "Du Pont has been competing vigorously with ICI in the British Empire, and it is logical to expect that in the British quest for dollar exchange they would try every means to better their competitive position in the U. S."

TO MAKE KILL—Sales of Arnold, Hoffman in 1948 totaled $7,187,000, biggest ever; for 1949 they were down to $5,850,000. But Lord McGowan, chairman of ICI, is well satisfied with the company's financial record and keen management. He plans to expand its marketing facilities in the U. S. to handle some of the 12,000 products, ranging from dynamite to penicillin, made in ICI's 100-odd British plants. Best of all, once the bank debt is cleared up, ICI can count on a steady flow of dollars from its U. S. sales.

Chemical imports to U. S. hit postwar low

U. S. imports of chemicals slid down to a postwar low in 1949. Imports fell from $323 million in 1947 to $276 million in 1948 and $230 million in 1949.

But this is only half the story. Compared with exports, the rate of chemical imports shows an even greater disproportion. For U. S. shipments of chemicals and allied products to foreign countries in recent years are about 370 percent higher than before the war.

The downtrend in imports is evidence of U. S. self-sufficiency in chemicals.

Here's another fact the figures show: although chemical imports increased in value almost every year until 1948, the prewar rate, as a percentage of total U. S. imports, has not been maintained since the war. The drop in chemical imports came at a time when other imports were running at $7 billion a year.

Why have chemical imports dropped so far behind the import rate of other commodities? Part of the answer is increased competition from U. S. producers. The foreign product, even if cheaper, often does not come up to U. S. standards.

Will the downward trend continue or be reversed as a result of current efforts to improve earned dollar credits abroad? Some reversal may take place. For one thing, devaluation of foreign currencies makes it possible for foreign goods to be sold in dollar countries at lower prices than formerly.

The reversal will be selective. Manufactured chemicals comprised 60 percent of U. S. chemical imports in 1938-39, rose to 74 percent in 1943, but were 44 percent in 1948-49. The downward trend in these will probably continue.

But in such natural products as shellac and carnauba, not produced in this country, the supply and demand factor will predominate. There will probably be no great change in these imports if present business levels continue.

Fertilizer imports are apt to increase as Europe improves its production. But imports of fertilizers will not reach the proportionate prewar levels because of enlarged U. S. output.

Minor increases might occur in coal-tar products and imports of industrial chemicals, but again, probably not in proportion to enlarged postwar U. S. consumption.

If Europeans made an effort, they could probably increase chemical imports to the U. S., but it is unlikely that they could exceed the 1947 highs.

More money going into oil research

Petroleum industry now spends $100 million a year on research—almost four times the amount spent 10 years ago. So reports Wayne E. Kuhn, chairman of the ACS's petroleum division.

The petroleum industry's plowback of earnings into research is increasing at a faster rate than that of the steel, chemical, electrical, lumber and wood products industries, Dr. Kuhn says. The ratio of petroleum research expenditures to sales has almost doubled since 1939.

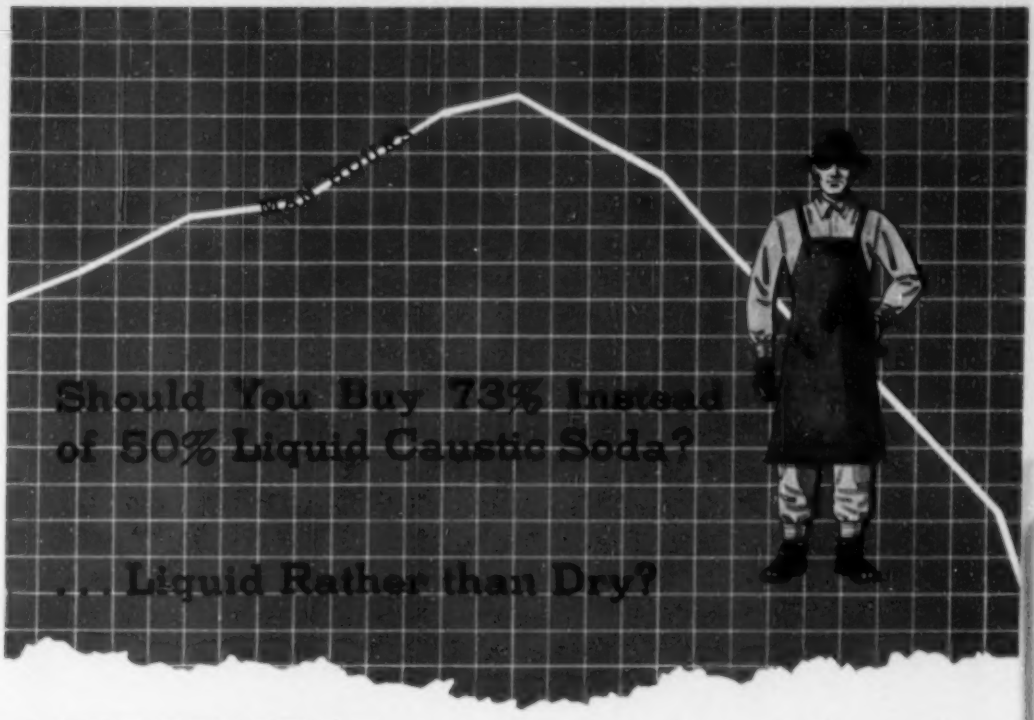
Shutdown at Winnie

Colorful oil man Glenn H. McCarthy, who recently put the bite on RFC for a $70 million loan, which, if granted, would be the biggest since the war, has shut down his chemical plant at Winnie, Tex. (see *Chementator*, Feb. 1950, p. 67). McCarthy has been having trouble with his chemical plant all along. That's one of the reasons he seeks the RFC loan.

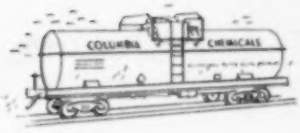
Why the shutdown? In part, climbing production costs are to blame. More basic reason for the shutdown, however, is that the plant, run by McCarthy Chemical Co., has been plagued by operating problems. Stone & Webster, now troubleshooting in the plant, is expected to come up with recommendations for design and engineering changes. These process and equipment changes, which may have to be made, had a lot to do with shutting down the plant. According to one associate, it has been a loser from the beginning.

From natural gas, the Winnie plant manufactured methanol, formaldehyde and acetaldehyde by oxidation. Rated maximum amount of feed gas handled by the chemical plant was 100 million cubic

(*Continued on page 84*)



COLUMBIA suggests—*a change may save you costly man hours*



A switch from 50% to 73% liquid caustic soda means 40% fewer cars to handle . . . the use of liquid rather than anhydrous caustic eliminates man hours required to unload, store, rehandle and dissolve. Today's competitive markets demand all possible manufacturing economies. That's why it may pay you to re-examine your methods and practices involving caustic soda.

The Columbia Caustic Soda Manual contains much data of value regarding the economics of the use of this chemical. Our Technical Service Department will be glad to supply any additional facts, without obligation, which you may need for analyzing your situation. Just write Pittsburgh Plate Glass Company, Columbia Chemical Division, Department CS-2, Fifth Avenue at Bellefield, Pittsburgh 13, Pennsylvania.

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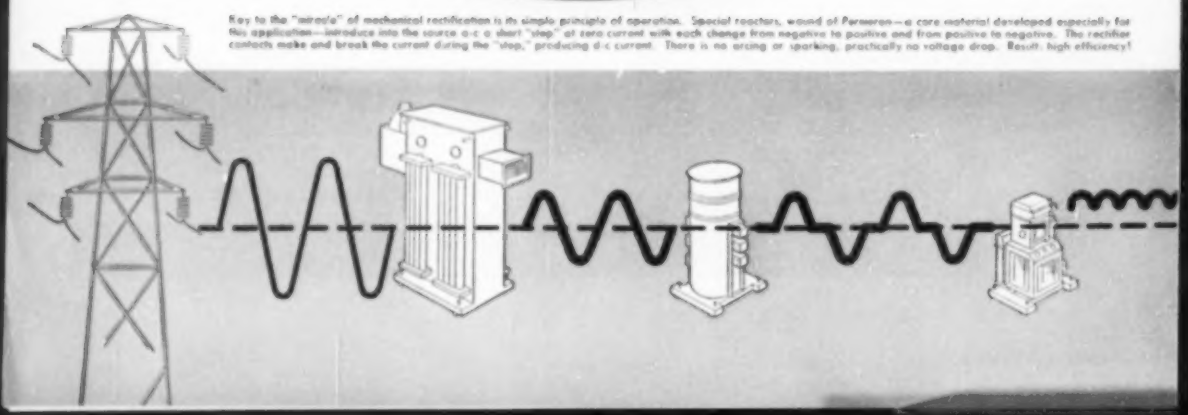

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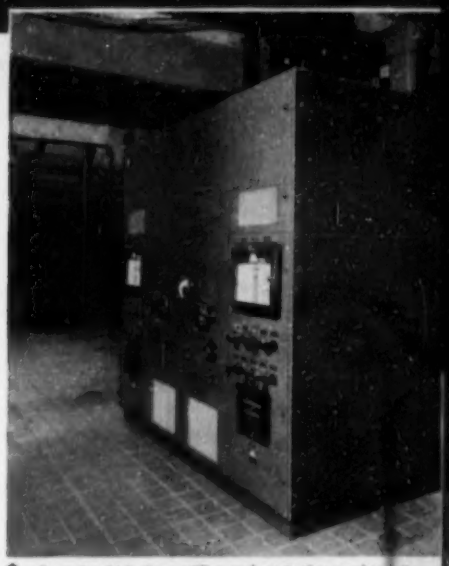
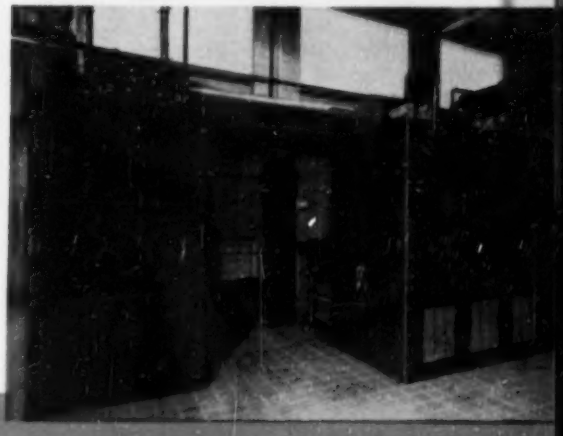
Get the complete story: You'll find complete technical information, including a detailed presentation of operating principles, in I-T-E's Bulletin 4809. Send for it today. The I-T-E representative in your locality will be glad to advise you on adapting the Mechanical Rectifier to your specific needs. Consult him without obligation.



Control cubicle for rectifier and protective equipment.

Mechanical rectifier and saturable reactor. Note small size and compactness of this installation.

Twin rectifier units (right) and control cubicle (left). Note clean appearance and absence of complicated external auxiliaries.



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feet a day. The highly touted bargain-counter oxygen unit at Winnie, first of its kind, could produce in excess of 200 gross tons of 90 percent oxygen a day.

Fomac Engineers, Houston, organized by C. E. Bloodworth, who had a big hand in the design of the highly successful petrochemicals plant of Celanese at Bishop, Tex., had charge of the pilot-plant work and process design at the McCarthy plant. Wyatt C. Hedrick Engineering Corp., Houston, was architect and engineer for the Winnie project. Incidentally, the Hedrick organization is now general contractor for, and financially interested in, the new $15 million petrochemical venture of Pontiac Refining Corp. and Chicago Corp. at Corpus Christi.

Ninety employees have been let go at Winnie. On two previous occasions the plant has been closed, but employees were kept on the payroll.

McCarthy is said to have conferred with Metropolitan and Equitable executives in New York. These two insurance companies are the ones from which he has received loans. The big question: Is McCarthy going to sell his chemical plant?

What do you look for in a job?

Young engineers greatly prefer opportunity for promotion, job satisfaction and a chance to use their own ideas to high pay, short hours and pensions, a survey conducted by R. S. Aries & Associates discloses.

A chance for promotion is considered 1½ times as good as high pay and 3 times as good as short hours in rating the attractiveness of a position. A chance to use one's own ideas ranks third, while pensions and insurance rank eighth.

Engineers prefer private industry to government work. They give an especially low rating to "chance to be of public service" as a job factor.

Jobs and wages in oil industry

The oil industry in the U. S. employs directly 1,880,000 men and women. And for each oil worker there are 4.2 other workers holding down jobs in industries directly related to petroleum. Combined annual payrolls for those who work in petroleum and related industries total $27,471,586,000, or 20.3 percent of the total annual payroll of all workers in the U. S.

Workers engaged in petroleum production and refining, many of them highly skilled technicians, are among the highest paid in the country, with average annual wages and salaries of $3,700. The average annual pay of the 1,880,000 oil industry workers, including service station attendants, is $3,077.

Newcomer at Carlsbad

Entry of another company into the potash business at Carlsbad, N. M., is heralded. Duval Texas Sulphur Co., which has changed its name to Duval Sulphur & Potash Co., plans to put up a $7.5 million plant there. Preliminary planning is under way, but no contracts have been let. It will take about two years to build the new plant.

Duval expects to mine and mill about 720,000 short tons of equivalent K_2O a year, or what it figures is between 10 and 15 percent of a total estimated U. S. K_2O production of approximately 1.2 million short tons in 1949. The three present producers at Carlsbad, International Minerals & Chemical Corp., U. S. Potash Co. and Potash Co. of America, together account for about 85 percent of total U. S. production, reported by the Bureau of Mines as 1,145,793 short tons of K_2O in 1949.

To get its ore, Duval will sink shafts 1,200 to 1,400 ft. below the surface. Ore will be crushed, sized and refined to produce high-grade muriate. To separate the potassium chloride from sodium chloride in the ore, Duval will use a flotation process. It is being worked out by company engineers. Outside engineers will cooperate later, according to Eugene German, treasurer of Duval. Stearns-Roger of Denver, Colo., has made some preliminary estimates on a flotation process for Duval. Only U. S. Potash at its refinery near Carlsbad uses fractional crystallization to recover potassium chloride.

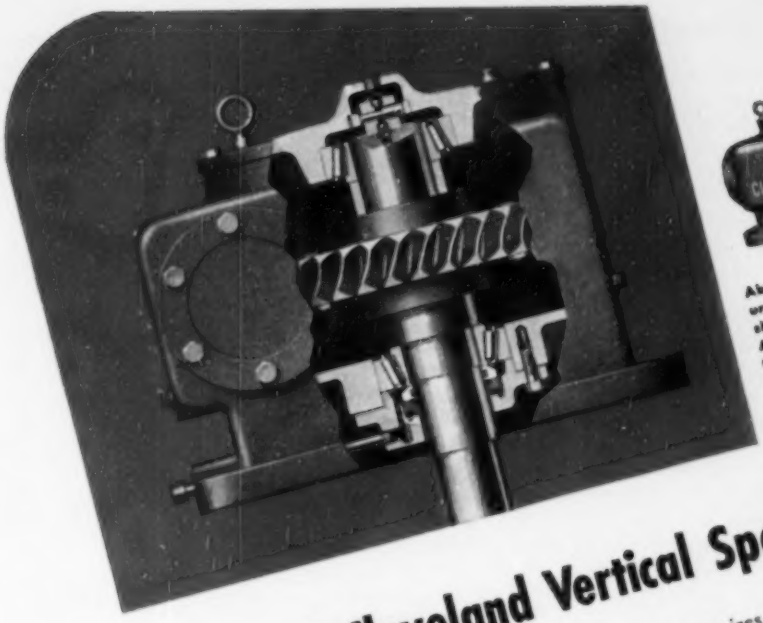
None of the patents covering existing processes for refining potash ore are held by Duval. Under a license agreement between Duval and Minerals Separation North American Corp., however, the company has acquired patented processes on a per ton royalty basis.

Duval holds prospecting permits from the U. S. Department of Interior on about 22,327 acres near Carlsbad, and also owns a potash lease from the state of New Mexico covering another 10,163 acres in the same area. To drill 60 holes in prospecting the federal lands, the company spent $450,000. On 6,525 acres covered by three of the federal permits Duval has discovered valuable potassium deposits in commercial quantities and has applied for 20-yr. leases. It is on 2,560 acres, covered by one of these three permits, that Duval proposes to construct its mining and milling facilities. Nine of the 16 holes put down into this tract, known as the Saunders Permit, resulted in the discovery of potassium deposits. It is estimated to contain at least 14 million short tons of currently exploitable potash ore.

United Gas Corp., the parent company, holds about a 70 percent interest in Duval. SEC has authorized Duval to increase capital stock to 1 million shares. There will be no underwriters. The company will borrow $2.5 million.

Two other companies are also toying with the idea of getting into the mining and refining of potash at Carlsbad. They are Southwest Potash Corp., a

(*Continued*)



Above—Exterior view Type ND unit. NU unit (not shown) has slow-speed shaft extending up. At left—Cutaway section to show tapered roller bearings on gear shaft, positive face-type oil seal, unique lubricating pump and oil drain at base of housing.

A new series of Cleveland Vertical Speed Reducers

● NU and ND worm gear units—in seven sizes each (50 to 500) are ready for prompt delivery. They are particularly suited to such equipment as agitators and mixers, and for use in connection with supplementary low speed spur gear drives, without outboard bearings.

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Extra heavy tapered roller bearings on gear shaft.

Continuous lubrication of top bearing by positively driven pump mounted on upper end of gear shaft (on lower end in Type NU).

Positive face-type oil seal below lower gear shaft bearing to prevent leakage.

Heavy base flange extends around all four sides. All parts liberally oversized and precision built.

Write for Bulletin 125 for full description of Types NU and ND, including capacity charts and dimension data. The Cleveland Worm & Gear Co., 3273 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers, Limited.

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subsidiary of American Metal Co., and the Freeport Sulphur Co. Both have acreage under lease at Carlsbad. Southwest Potash is going ahead with its extensive drilling program, but has not yet started ore development.

Glycol galore in 1951?

By year's end the total supply of ethylene glycol should be enough to meet all industry needs.

During 1949, Carbide & Carbon, the largest producer, completed new glycol capacity at its Texas City and Institute, W. Va., plants. Other big production units are now under construction at Institute and at Carbide's Whiting, Ind., plant. By the end of this year, these units should be operating at capacity.

Production of ethylene glycol in 1949 approximated 420 million pounds. It is estimated that by the beginning of 1951 the total capacity of the entire industry will be increased by more than 50 percent. This added output should more than keep up with climbing demand for anti-freeze and other uses.

Butane for bus motors?

Butane is getting serious consideration by bus operators as a possible motor fuel. Its cost is a fraction that of gasoline and fuel oil. Moreover, it has advantages other than price.

When used as a motor fuel, butane provides almost complete combustion, hence exhaust odor and dilution of crankcase oil are virtually eliminated. Butane's main disadvantages are that it requires special storage tanks, dispensing systems and special carburetion.

More titanium dioxide coming

Glidden Co. plans to enlarge facilities at its Baltimore, Md., plant to produce about 15,000 tons of titanium dioxide a year. For its Baltimore operation, Glidden will tap new deposits in Canada. To cost $2.5 million, the expansion will take a year.

ECA backstops Heyden's French venture

Receipts on its investment in French streptomycin manufacture can be converted into dollars by Heyden Chemical Corp. under terms of an industrial guaranty contract signed by Heyden and the Export-Import Bank of Washington, D. C., as agent for ECA. The guaranty is the first issued by ECA for an industrial investment in France.

Of Heyden's $100,000 investment, $50,000 in cash is for purchase of equipment and supplies; and $50,000 is for engineering and technical services, computed at actual dollar cost. The guaranty is for $175,000, covering a capital investment of $100,000 plus an earnings increment of $75,000.

Up to now, France has produced little streptomycin. Instead, it has imported large quantities from the U. S. despite the French dollar shortage. During its first year, ECA financed streptomycin shipments to France worth $6 million.

The French recovery program calls for two plants to take care of France's minimum needs. The Heyden plant is expected to supply about 40 percent of national requirements.

Heyden's investment is in the stock of the French company that is building and will operate the new plant, which employs Heyden processes. Entire project calls for a capital outlay of more than $1 million, of which $290,000 represents an ECA allotment for the French program. Substantial French interests are providing local currency needs, real estate, buildings and some equipment.

Receipts eligible for conversion include dividends on stock of the French company and proceeds of any liquidation thereof, as well as royalties on sale of streptomycin payable to Heyden.

Texas hikes sulphur tax

Texas has increased the state's tax on sulphur by 10 percent, bringing the tax to $1.399 per long ton. Revenue from the tax will go to defray expenses of charitable institutions in the state.

New plant to strip natural gas

Tennessee Gas Transmission Co. plans to build a $12 million plant in western Kentucky to remove liquid hydrocarbons from the natural gas passing through its pipeline. The plant will be operated in conjunction with a much larger plant to be built in the same area by a subsidiary of Mathieson Chemical Corp., which is now in the process of being organized.

The Mathieson plant will be run by Mathieson Hydrocarbon Chemical Corp., whose stock will be jointly owned by Mathieson Chemical and a group of outside stockholders. Tennessee Gas will have no interest in this plant, which may cost as high as $25 million.

The plant of Tennessee Gas will lower the Btu. content of the pipeline gas to 1,033 from 1,048. Although the gas shipped now is "lean," the new stripping plant should remove objectionable residues that will provide a source of byproduct income. Gas deliveries of the company are now running between 740 million and 750 million cubic feet a day. Average daily deliveries for 1950 should reach a total of 800 million cubic feet, compared with 600 million cubic feet last year.

Both plants will be located in western Kentucky because of the freight rate advantages. Actual location of the new plants to be built in Kentucky has not been disclosed. Final arrangements for the operation with Mathieson Hydrocarbon Chemical Corp. are being worked out.

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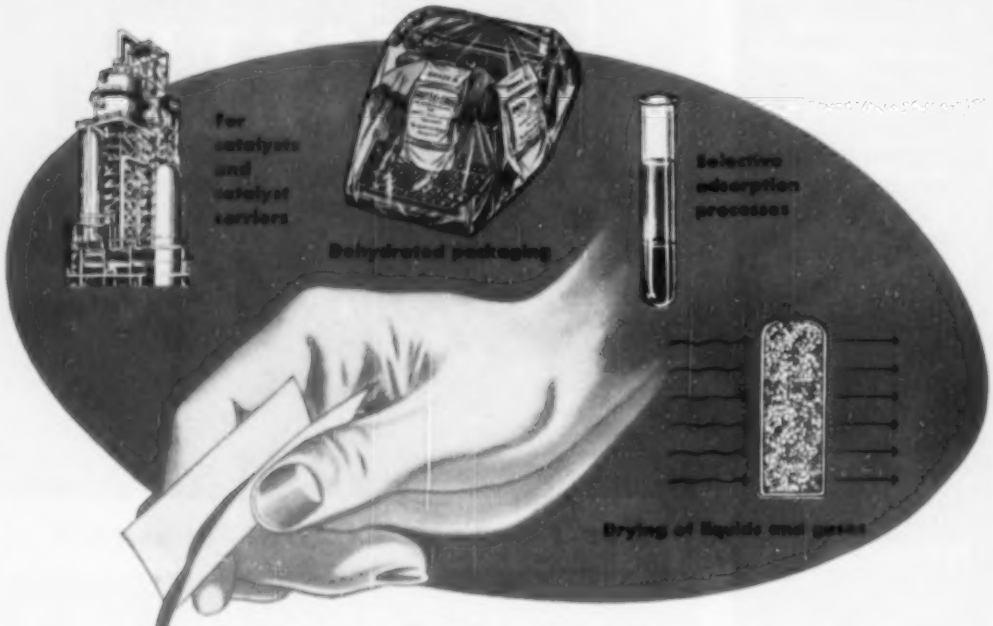

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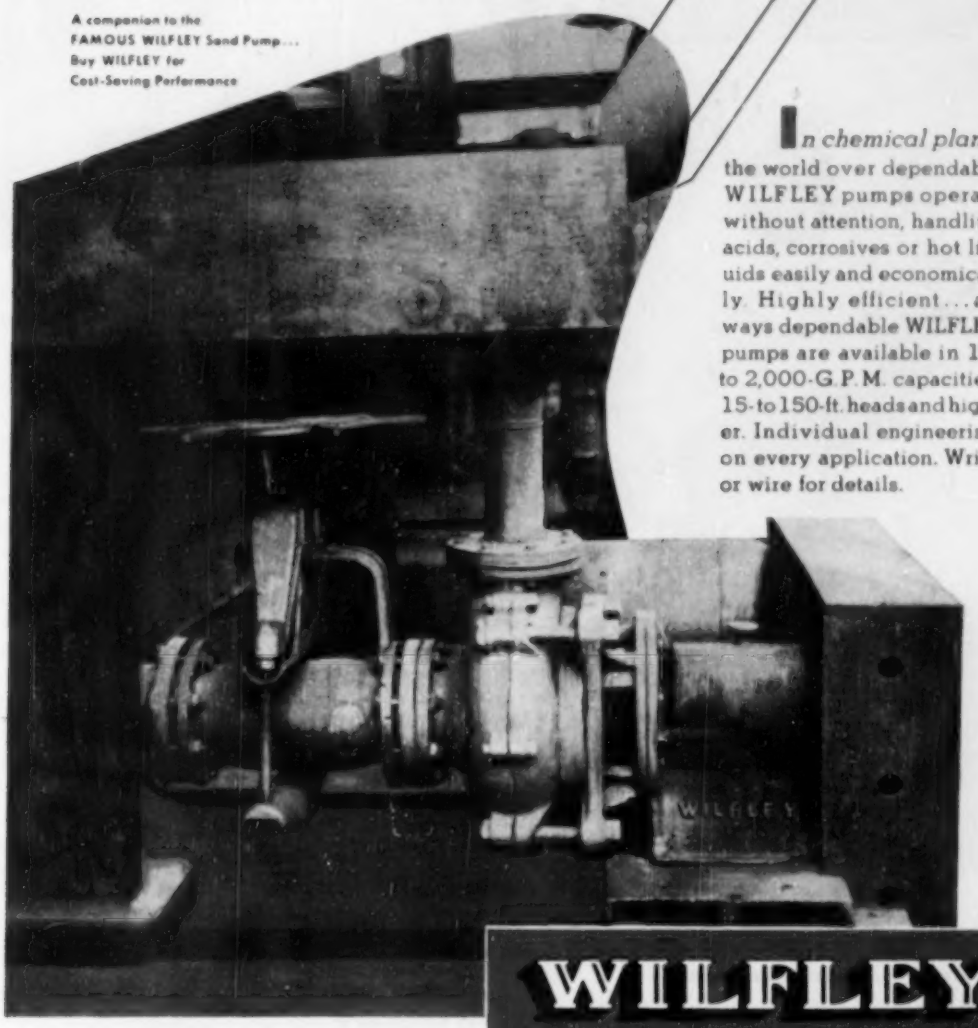

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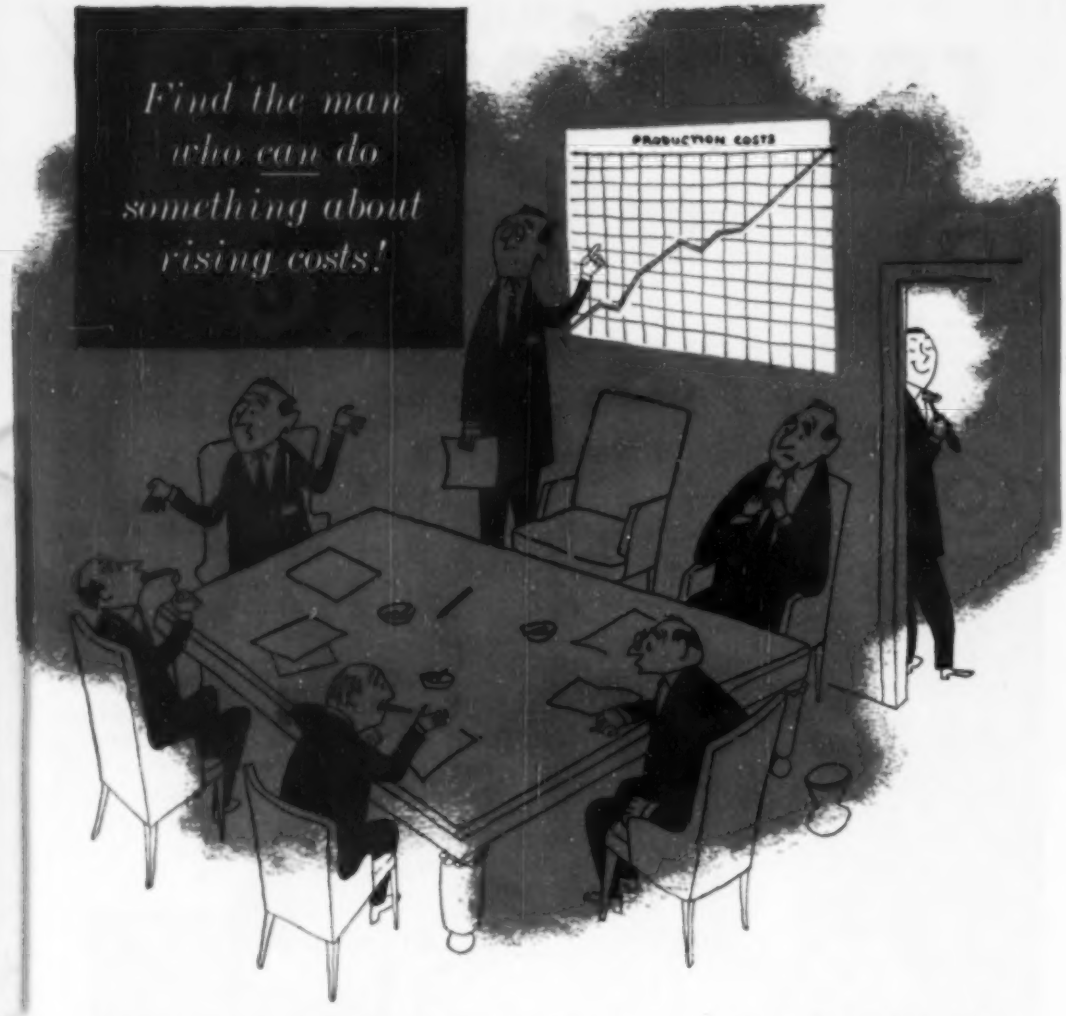

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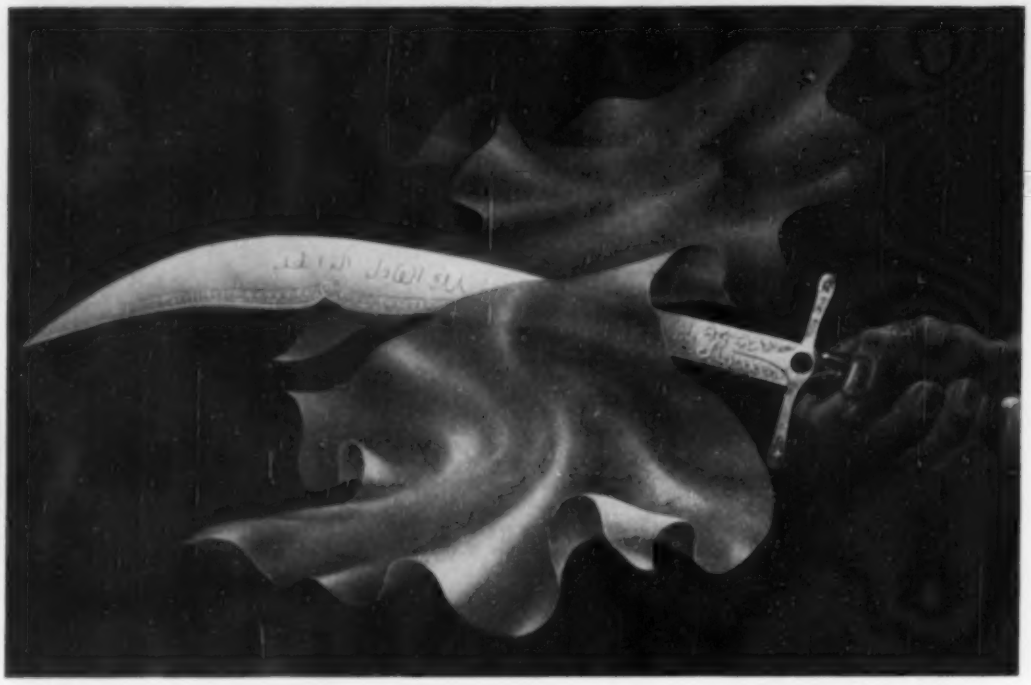
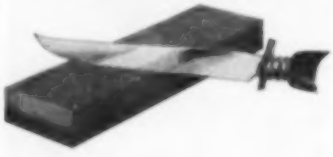
A stone fit to sharpen Saladin's scimitar



TO demonstrate the might of Christian arms during the Third Crusade, Richard of England split a steel mace with a single blow of his broadsword. Whereupon the Moslem leader, Saladin, is said to have countered by severing a silken scarf simply by letting it settle on the edge of his razor-sharp scimitar.



While you may not want your cutlery *quite* as sharp as Saladin's fabulous scimitar, it's still a fact that the difference between a good blade and a poor one lies in its cutting edge. It's also a fact that knives sharpened on a stone of ALCOA Alumina have *keen* cutting edges.

ALCOA Alumina is aluminum oxide—a crystalline material almost as hard as a diamond—with extremely sharp edges and corners. It is from this characteristic that alumina derives its value as an outstanding, fast-cutting abrasive.*

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*ALCOA does not make sharpening stones. Buy cream- to buff-colored aluminum oxide stones from your hardware dealer.

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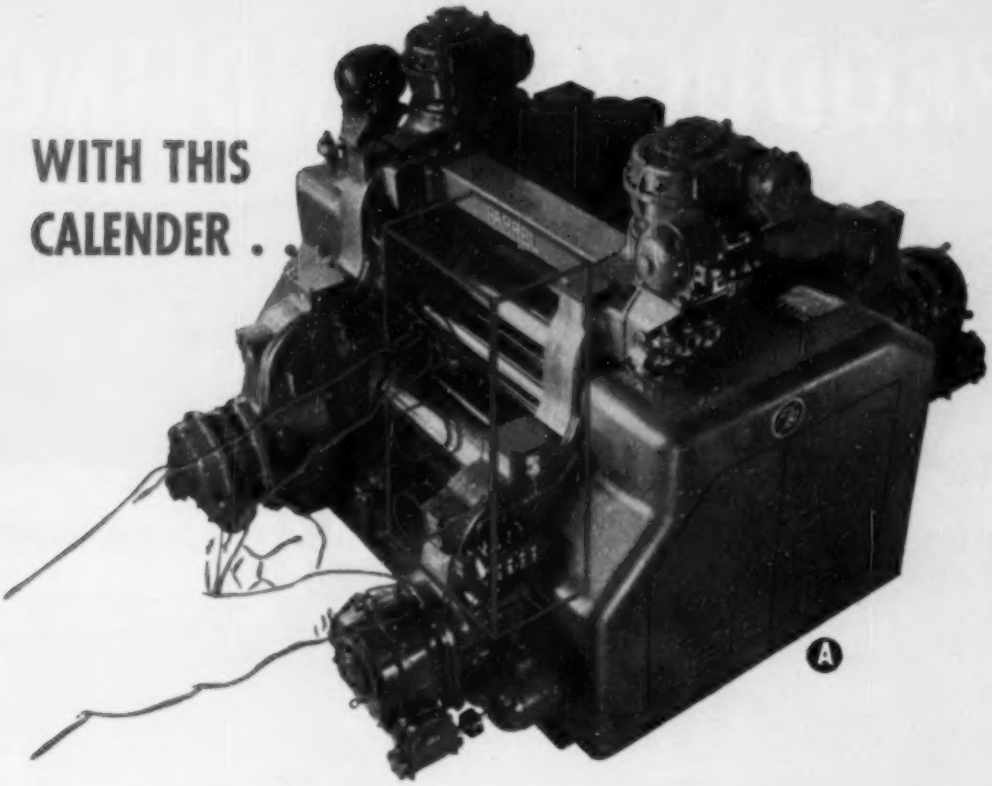
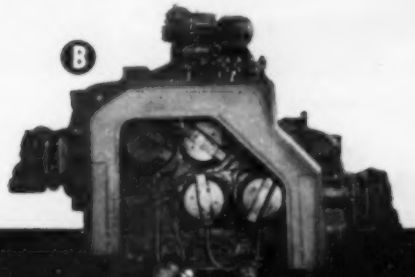
WITH THIS CALENDER . . .



. . . you simply push a button to vary roll "crown"

A The Farrel-Birmingham Z-type calender was developed for production that demands extremely accurate gauge and temperature control. Plastic film is being produced regularly on the Z-type calender with a variation in thickness of only *plus or minus .0001".*

B View showing the Z arrangement of rolls and connections for universal spindles from the uni-drive. Preloading devices eliminate backlash and hold the rolls firmly in their operating positions.



A unique feature of Farrel-Birmingham's new Z-type calender is its ability to handle a wide variety of stock compositions, at varying speeds, with extremely close control of temperature and gauge.

A built-in device for crossing the axes of the rolls compensates for roll deflection. Crossing the rolls (which is closely equivalent to varying the roll crown) is accomplished quickly by push-button control.

For film production, the two lower rolls are equipped with this device to adjust the rolls accurately for the final pass. For double coating, this feature can be installed for both upper and lower bank passes.

Among the many other advantages of this calender are: (1) Vertical pressure from a third roll cannot affect roll settings, (2) positive roll positioning provided by hydraulic pullbacks, and (3) in film production, exposure of material in initial passes limited to a 90° arc of roll surface.

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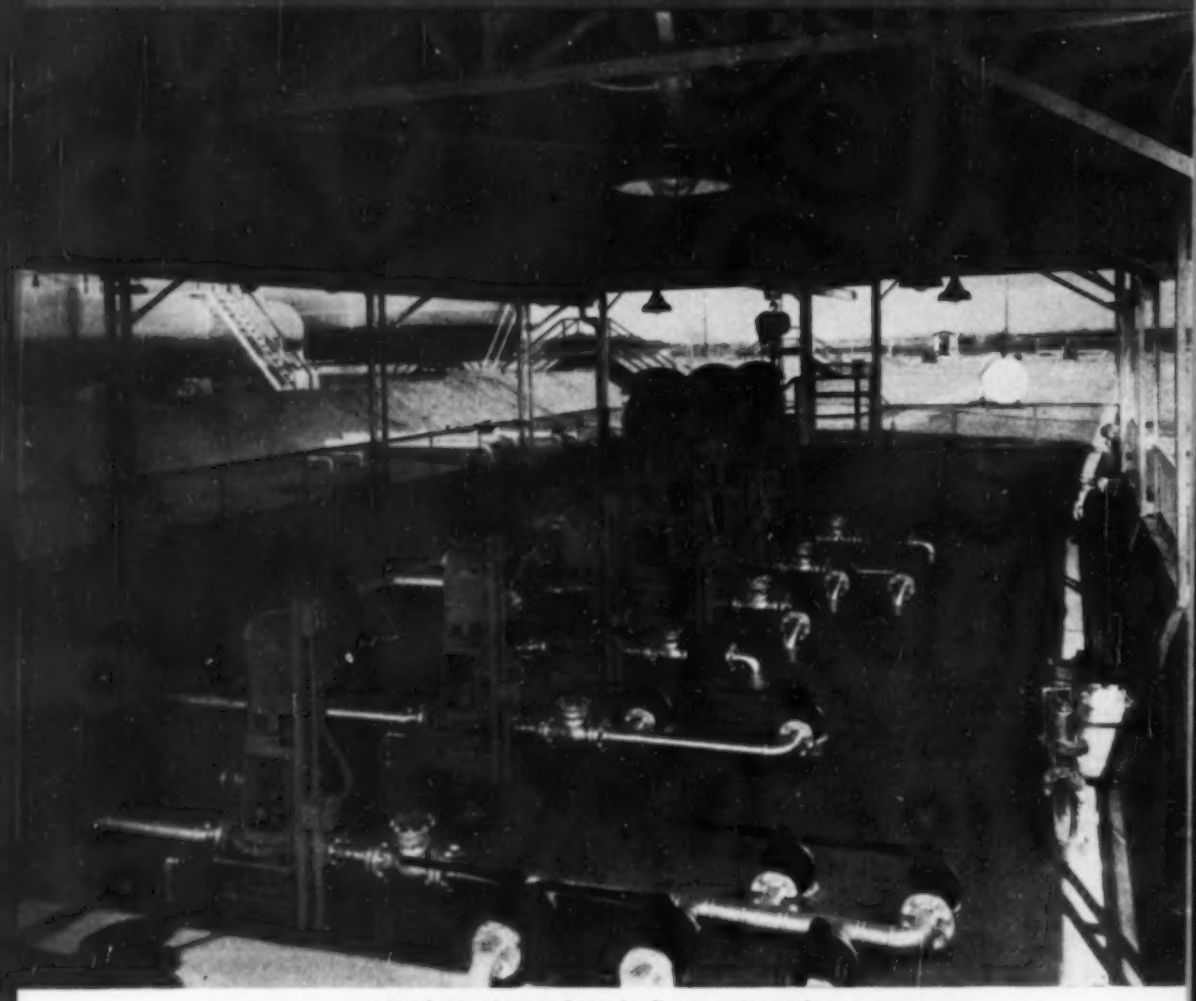

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● In handling chemical products you first consider *safety*. That calls for ever-tight valves, corrosion-resistant, free to turn easily, positively sealed around the ports regardless of line pressure. Note how perfectly the Nordstrom design fits these specifications. The tapered plug is pressure lubricated, held tight on its unexposed seat by resilient means; the lubricated seat permits easy rotary turning of the plug, as contrasted to metal-to-metal unlubricated seats in common types; "Sealdport" lubrication surrounds each port to prevent leakage; the plug can be hydraulically jacked when required.

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Install them, for test, side by side with any other type, check their operation, compare their performance . . . make a record of maintenance costs. You will find them to be tops in performance—and by far the most economical valves you have ever used. Successful operation of over 5,000,000 Nordstroms is proof of performance.

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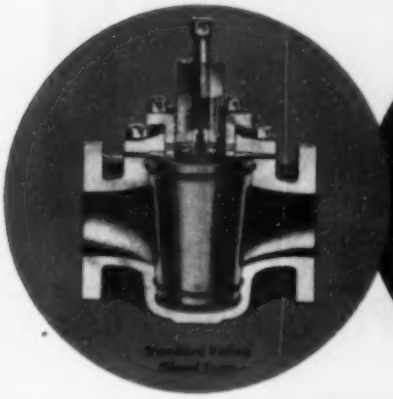
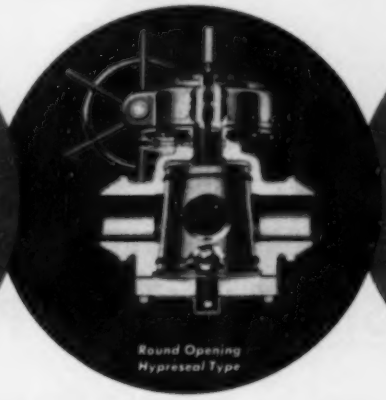
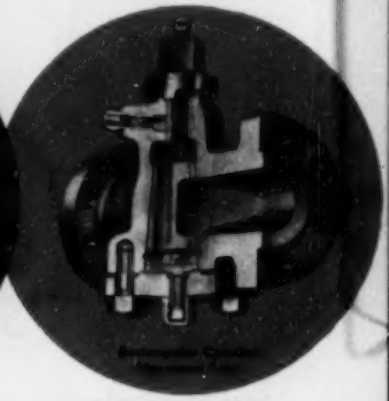
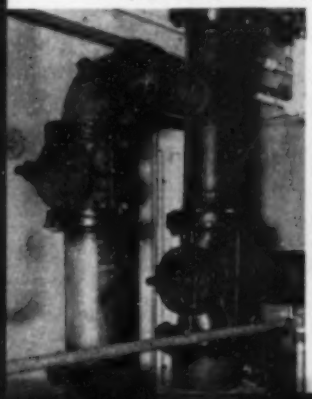




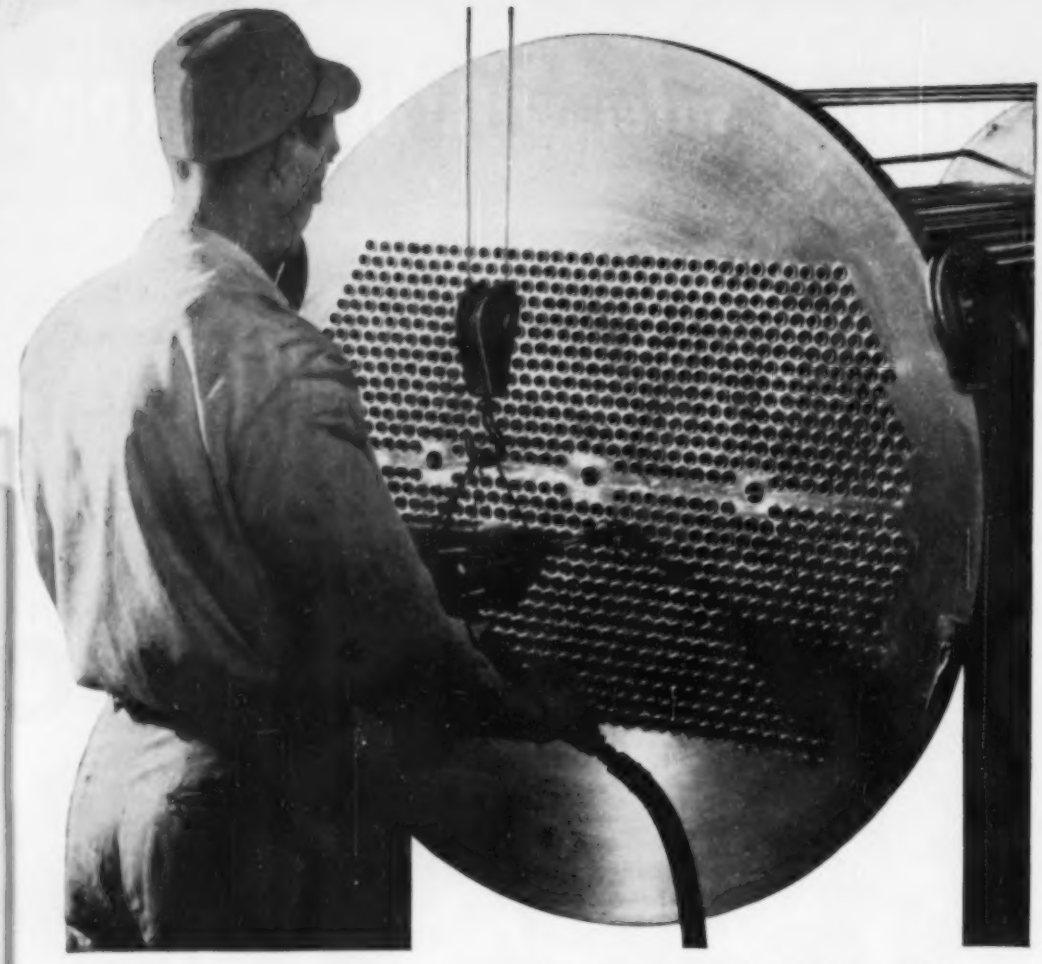


In a pharmaceutical laboratory



Steam jacketed Nordstroms in a sulphur plant

Handling hot varnish (Stainless steel)



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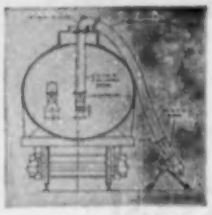

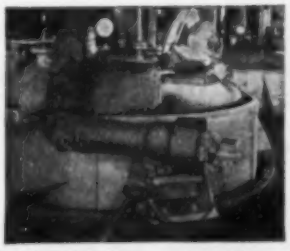

Vano Design "A" supplying fresh air in Reactor Room of Synthetic Rubber Plant.

Vano Design "A" Ventilator supplying fresh air to men working in wing compartments, fuselages, etc.

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Vano Design "C" equipped with 8" discharge tubing removing welding fumes.

Vano Design "C" equipped with two suction lines removing welding fumes for operators' safety.

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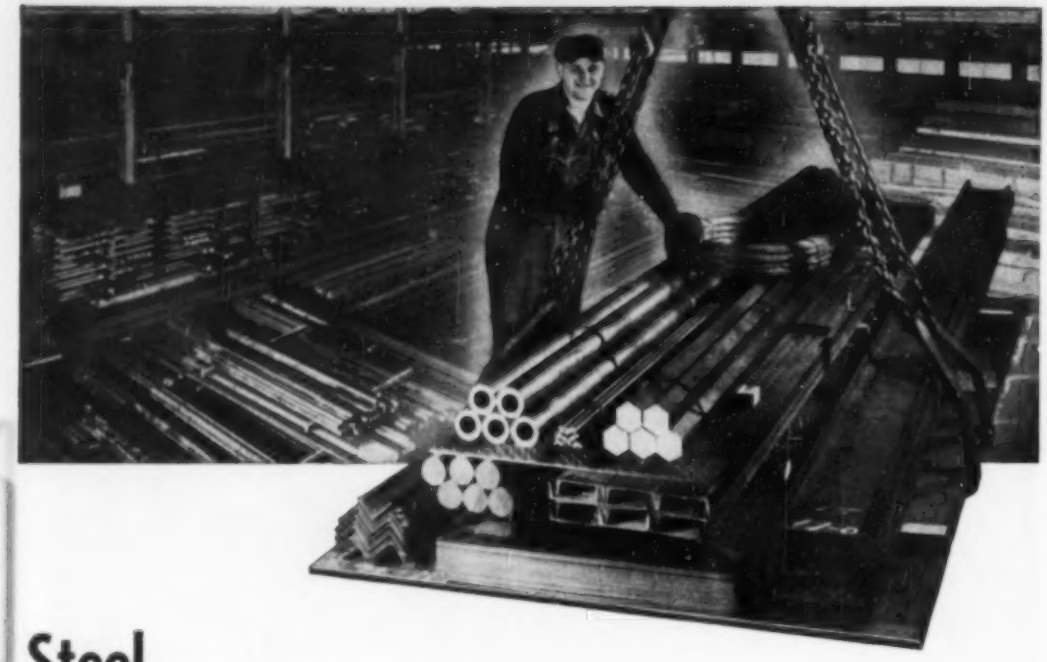

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ESTABLISHED 1902 SIDNEY D. KIRKPATRICK, Editor

Chemical Engineering
WITH CHEMICAL & METALLURGICAL ENGINEERING

APRIL 1950

Companies, Too, Must Be Well Rounded

Judging from our continuing correspondence, there is some disagreement with the editorial views recently expressed here under the title "Younger Blood for Executive Veins." We have been roundly criticized for promoting discrimination against older men in positions of major responsibility. Our correspondents have reminded us that vitality, stamina and ambition are not youthful monopolies—that these are often wholly false excuses or are more than balanced by experience, wisdom, skill and judgment. Being reminded by our own calendar of that old Chinese proverb, "Perhaps it's later than you think," we hasten to restate and, we hope, clarify our position in this age-old controversy.

We took up our cudgels for youth primarily because of two observations. First was the fact that business executives in many chemical companies are staying in their jobs much longer than they did twenty years ago. Second, is the scarcity of properly trained young men to take their places. So we urged, apparently without too much conviction, that something should be done (1) to improve the quality and quantity of replacements and (2) to stimulate management into providing the necessary incentives, even if it meant moving over to make room for these deserving youngsters. But we missed our targets completely if our remarks added impetus to the shameful wave of dismissals and involuntary retirements that have swept through many companies in recent months.

Mainly responsible is the hue and cry for security and the questionable pension plans that are being forced on industry. As Peter Drucker points out in an able article in February *Harpers*: "The fewer older workers there are in a plant, the more favorable the pension plan for both employer and workers. The employer carries a lower pension burden, the workers get higher individual pensions. Both will unite in shutting the gate to the older man who applies for work." Selection of men, even for positions of major responsibility, is being based on age as the first requirement. Otherwise excellent qualifications simply don't count. At least that's the report we get from several who write from "vital, stinging, first-hand experience."

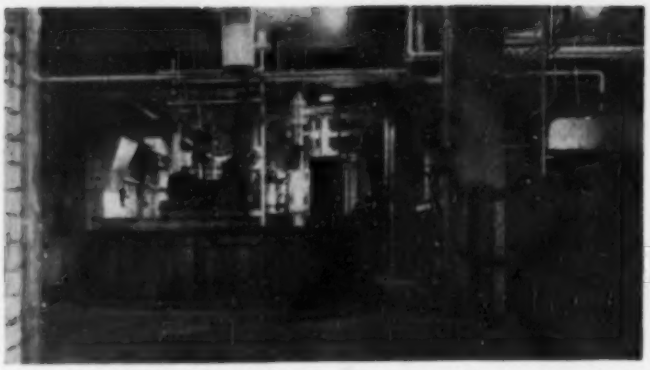
All this, we feel sure, reflects only a temporary situation which fortunately does not prevail in most of the process industries. As industries go, we are younger and have benefited by the creative research of younger men. But for our corporate and professional progress and stability we have to thank the older heads among us. Their knowledge gained through priceless experience is helpful at every stage of our business. To lose the services of these men is certain to mean mistakes and costly interruption of progress and profits.

So, then, we would renew our plea for well-rounded technical men, capable of coping with the growing social and economic problems of our times. But we want also to see well-rounded companies, and departments within companies, where there is sound use of age as well as youth. Chemical engineers and other professional personnel can help most by seeing that this necessary and logical balance is maintained in the ranks of their own organizations. Youth must and should be served, but not at the expense of penalizing the future progress of our industries and professions.

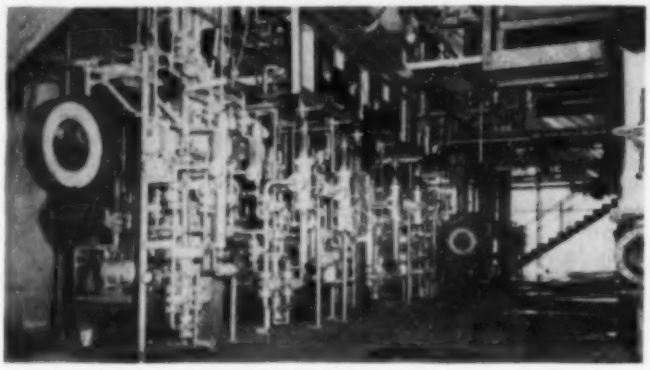
* * *

P. S. We've also heard from a goodly number of promising but still inexperienced youngsters who are struggling to get a hold on even the lowest rung of the ladder. If you are interested, let us tell you where to look for your 1970 executives!

During the last fourteen months Goodyear converted a regular GR-S unit to continuous polymerization at low temperature. This is a problem-by-problem account of the conversion. One of the toughest jobs was trying to keep air out of the process.



ACTIVATOR PREPARATION TANK. Had to be equipped for direct steam heating and rapid cooling. Agitation was adjusted to prevent vortexing.



CHARGING EQUIPMENT. Installed in reactor building to control continuous flow of raw materials to reactors. Rotameters predominate.

Pictured Flowsheet Page 176

How Goodyear Converted

J. B. MITCHELSON and D. H. FRANCIS

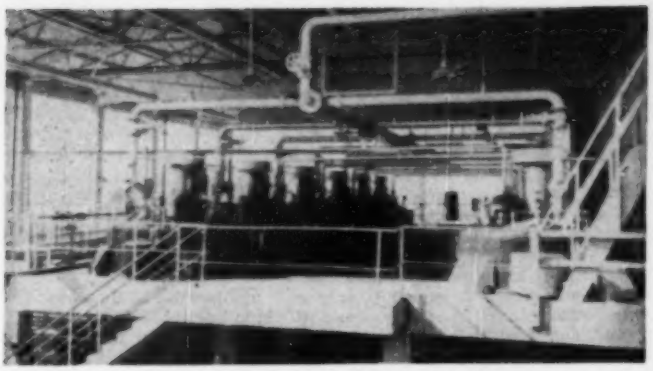
Synthetic rubber of the GR-S type as manufactured during World War II was primarily a copolymer of butadiene and styrene prepared at 122 deg. F. in an emulsion of hydrocarbons, water and sodium fatty acid soap. This was the so-called general purpose synthetic rubber, used for tires and numerous other products. Minor formula adjustments have made possible many applications of this rubber for specialties. One of the first alterations in the GR-S formulation was the substitution of disproportionated rosin acid soap for fatty acid soap.

The polymerization of this early rubber was carried out in batch reactors, the size of which varied from 5 gal. kettles used for laboratory development to 3,750 gal. vessels used in production plants.

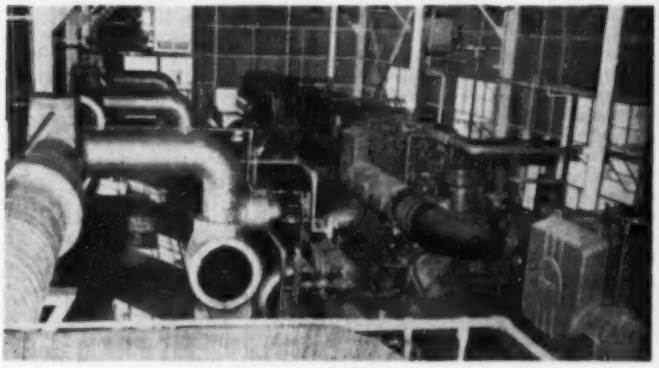
In 1940 the government took steps to stockpile natural rubber as a preparedness measure. Later synthetic rubber plants were built by the government and a research and development program established. Responsibility for these activities was centralized in Rubber Reserve Co. (RFC) and in the Office of the Rubber Director.

An important change in production plant polymerization practice resulted from the development of continuous polymerization late in 1942 by the chemical engineering division of the Goodyear Tire & Rubber Co. working through the Rubber Reserve Development Program. This first unit was a small pilot plant set-up consisting of four 12 gal. baffled reactors equipped with agitation and temperature control. The success of this pilot plant continuous GR-S process led to plant conversion early in 1944 of a 30,000-long-tons-per-yr. line at the Rubber Reserve Plant operated by Goodyear at Houston, Tex. Since that time the continuous process for polymeriza-

J. B. MITCHELSON *and* D. H. FRANCIS *are both Goodyear engineers —the former with Goodyear Tire & Rubber Co. in Akron, the latter with Goodyear Synthetic Rubber Co. at the plant in Houston.*



REACTORS. Insulated for operation at 41 deg. F., re-piped for continuous flow. Reactors are 3,750 gal. vessels—glass-lined, jacketed, agitated.



REFRIGERATION COMPRESSORS. Four 400 hp. ammonia compressors (one a spare) had to be installed to keep reactors cold. Brine is cooling medium.

To Cold Rubber

tion of GR-S has found increasing acceptance by the majority of the synthetic rubber industry.

At the close of World War II, considerable interest was being developed in a new type of butadiene-styrene copolymer. Many investigators reported that with a substantial decrease in polymerization temperature a considerable increase in polymer physical properties was realized. Through the efforts of Rubber Reserve, information related to lower temperature polymerization, ranging from 104 deg. F. to sub-zero, was compiled, including data from laboratories in Germany. This information was made available to those companies participating in the Rubber Reserve development program. This information with subsequent work has developed a series of formulas which can be classified as: high sugar, low sugar or sugar free. A large number of polymers have been made under these classifications and are generally termed "cold rubber." The polymerization temperature in most formulas is 41 deg. F.

DEVELOPMENT

After evaluation of polymers prepared by various formulas of the several classifications, Goodyear was most interested in the potassium soap of rosin acid and low sugar receipe. This formula was of the type first introduced by Phillips Petroleum Co. of Borger, Tex., and later put into production, using batchwise process, by Copolymer Corporation of Baton Rouge, La.

The formula was divided into three portions of which the monomers were one, the soap solution another consisting of 160 parts of water to which were added the emulsifier and electrolyte. The activator was the third portion and contained the remaining 20 parts of water to which had been added potassium pyrophosphate, dextrose and ferrous sulphate. The plasticity of the resultant polymer was modified by the addition of a mercaptan to the monomers. The reaction was catalyzed by injecting an organic hydroperoxide.

The experimental continuous polymerization equipment consisted of twelve 5 gal. glass-enameled reactors with cooling jackets and suitable agitation. These reactors were set in a straight line and the charge materials were introduced into the bottom of the first reactor. The discharge was out of the top of the first reactor and into the bottom of the second. This procedure continued through the remainder of the reactors and the final discharge left the top of the last reactor of the series. The temperature of the reactors was maintained by instrument-controlled calcium chloride brine circulated through the reactor jackets. The brine was cooled by passing it through a heat exchanger connected to a Freon ice machine. This equipment is part of a synthetic rubber pilot plant owned by the Office of Rubber Reserve and operated by Goodyear in Akron, Ohio.

The first run on low temperature (41 deg. F.) polymerization in the pilot unit, using potassium soap of rosin acid, low sugar formula, was started in February 1949. The purpose of the run was to develop techniques which could be used in production equipment at a later date. The delivery of the different raw materials was made to the system as follows: butadiene and styrene were pressured separately through their respective rotameters. Soap solution was pumped by means of a gear pump through a rotameter and the activator was either pumped separately or added with the soap solution. The organic hydroperoxide was pumped in separately. All materials except the peroxide met in a common header prior to the first reactor. The organic hydroperoxide was added to the header at the entrance to the first reactor.

Start-up was accomplished by evacuating the reactors to 100 mm. Hg and closing the valves on interconnecting lines to each reactor. The

delivery of raw materials was then started to the first reactor. When the first reactor was filled, as indicated by increase above equilibrium pressure of approximately 4 psig., the valve to the second reactor was opened slightly until this reactor was filled. This procedure was continued until the system was filled.

The original pumping rate was set to give an 18 hr. holdup time to a 60 percent conversion. At the end of four days' operations, the percent conversion, as determined by total solids content of the latex, indicated that 18 hr. set time was too long. A new rate of 16 hr. holdup was initiated by speeding up the charging of all materials. This rate was satisfactorily maintained for a 23 day period.

Concurrent work in 20 gal. batchwise polymerizations indicated that this formula for cold rubber was extremely sensitive to oxygen. By reducing the oxygen content of the charge water from saturation of approximately 7 ppm. to less than 1 ppm. and by reducing the vortices in water solution makeups, such as soap solution and activator, and by cautious charging to eliminate inclusion of air, it was found that batchwise reaction time could be decreased from 20 hr. to 13 hr.

Techniques observed from batch operation were applied in the following manner to the continuous unit. The water used for charging was heated to 200 deg. F. to reduce the oxygen content to 1 ppm. or less. The speed of agitators used for soap makeup and activator makeup was reduced until the vortex was eliminated. As a result of these changes to eliminate oxygen from the system, an increase in reaction rate was noted. The holdup time was reduced to 14 hr. and the run was continued for a total of 1,848 hr.

Typical data for this run were as follows:

Reactor No.	Percent Solids
2	6.5
5	12.0
8	18.6
11	23.4
Final	24.0

Sixty percent conversion was equivalent to 24.2 percent solids when utilizing a 50 percent venting factor.

EXPERIMENTAL

During the first part of 1949 the Office of Rubber Reserve had entered into a program to convert a portion of each of its synthetic rubber plants to low temperature polymerization. One of these plants is located at Houston and operated by the Goodyear Synthetic Rubber Corp.

By the first of August, a 15,000-long-ton-per-yr. line consisting of twelve 3,750 gal. reactors was completed for 41 deg. F. continuous polymerization. The formula used during the start-up operation in the production plant was the same as that used in the development unit. The soap solution was made up in a 3,000 gal. wood tank, using water from a deep well containing less than 0.5 ppm. of oxygen. This water was passed through a sodium cycle water softener and used at room temperature. To a tank of water was added the emulsifier and electrolyte. With a minimum of agitation these materials were dissolved. The soap solution was pumped by a centrifugal pump through a rotameter to a charge header and thence through a heat exchanger to the first reactor. The monomers were blends of fresh and recycle butadiene and styrene respectively, blended in a tank farm to a purity of 95.5 percent. The butadiene was pumped from the tank farm through a caustic washer, for the removal of inhibitor, into a surge tank in the reactor area. It was then pumped through a rotameter into the charge header. The styrene was pumped from the tank farm to a surge tank and thence through a rotameter to the charge header.

The activator was prepared in a 5,000 gal. wood tank. To the necessary amount of water were added potassium pyrophosphate, dextrose and ferrous sulphate. This solution was pumped through an orfice meter to the charge header between the heat exchanger and the reactor.

The organic hydroperoxide was injected into the charge header between the activator addition and the reactor.

For the initial operation, the reaction time was set at 18 hr. holdup. Shortly after the system was filled it was observed that the desired 60 percent conversion was not being reached. Shutdown times of 6 to 10 hr. were required out of every 24 hr. The holdup time was then changed to 24 hr. and a program introduced to determine the cause of slow reaction rates. The pumps delivering the soap and activator solution were found to be leaking. Sodium hydrosulphite was added to the soap solution as a scavenger to react with the oxygen entering through the leaking pumps. Tightening of the pump packing had very little effect on reducing the amount of air leakage. Liquid seals and mechanical seals were then installed on all solution pumps and the amount of air leakage from this source was reduced to a minimum.

It was also found that the butadiene contained from 5 to 10 ppm. of oxygen. This was traced to the recycle butadiene from the recovery building. The process of recovery of unreacted butadiene and styrene operated at atmospheric pressure or under vacuum. There were numerous valves and pumps which were found to be leaking. The recovery system was changed to insure leakproof valves and pumps. In the meantime, sodium hydrosulphite was being added to the caustic washer through which all butadiene must pass. Approximately 24 lb. per day were required.

The activator solution was prepared by heating a water solution of dextrose and potassium pyrophosphate to near boiling for a short period of time, then rapidly reducing the temperature to 110 deg. F. where ferrous sulphate is added. Over or under aging at the increased temperature will yield a solution of reduced activity. Also the addition point of ferrous sulphate has a marked effect on the activity of the solution. Initially the solid ferrous sulphate was added to the activator tank. By dissolving this material separately and adjusting the pH to approximately 3.0 prior to its addition to the dextrose-potassium pyrophosphate solution, a more active activator with less precipitate was obtained.

Changes mentioned above reduced the reaction time from approximately 18 hr. to 14 hr. on batchwise reactions. Using the same solutions that produced reaction times of 14 hr. on batchwise reactions, a total holdup time of 17.5 hr. was obtained in the continuous system. Work is being conducted by Goodyear and others in the evaluation of charging procedures to yield a shorter reaction in the continuous system.

After several weeks of operations it was noted that precoagulation of latex was occurring in the recovery operation, indicating low latex stability. In order to increase latex stability the electrolyte used for viscosity reduction was changed from potassium chloride to an equal amount of trisodium phosphate. Due to increased viscosity caused by this change, the water-to-monomer ratio was increased from 180:100 to 200:100. At the same time the excess caustic formerly used with the soap solution to maintain a solution pH of approximately 12.0 was eliminated. These changes have effectively decreased precoagulation to the point that it

does not interfere with continuous operations.

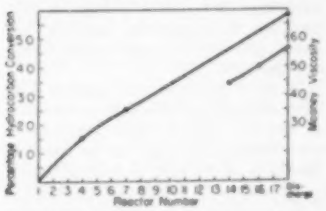
	Original Formula	Revised Formula
Butadiene (100% purity)	71.0	71.0
Styrene (100% purity)	29.0	29.0
Total water	180	200
Dresinate 214 (anhydrous basis)*	4.5	4.5
Triton K-100	.1	.1
KCl	.6	.....
Trisodium phosphate	.....	.5
Sodium hydroxide	.15	.03
Cerelose	1.00	.95
Tetra potassium pyrophosphate	.15	.20
Ferrous sulphate	.105	.12
Cumene hydroperoxide	.10	.10
Sulphole mercaptan	.18	.18
Soap solution pH	12.0	10.5
Latex to recovery pH	9.63	9.86
Latex from recovery pH	9.22	9.10

* Dresinate 214 is a trade name for potassium rosin soap manufactured by Hercules Powder Co.

This table shows changes made in the formula, together with the pH obtained at various points before and after the reduction in caustic content.

CONTROL OF PROCESS

The primary control of the polymerization reaction was based on the potential Mooney viscosity of the polymer contained in the latex. The proper balance between the hydrocarbon conversion and the Mooney viscosity was maintained by adjusting the modifier charged to the continuous system. An increase in the modifier charged caused an increase in the hydrocarbon conversion at a constant Mooney viscosity. Below is a typical plot of the reactor position in the continuous line vs. the hydrocarbon conversion and Mooney viscosity.



When the desired Mooney viscosity was attained, the reaction was short-stopped by adding a 10 percent styrene solution of dinitrochlorobenzene to the latex. In the continuous system the holdup time was adjusted by varying the number of reactors in the chain or by changing the charging rate. For more rapid control, the temperature of the last four reactors was varied by as much as ±2 deg. F. from the set temperature.

PLANT CONVERSION

Changes in the solution preparation area for the conversion from regular to low temperature polymerization consisted of the installation of additional equipment to handle the rosin soap, modifier, cumene hydroperoxide, dinitrochlorobenzene and alterations to existing equipment for the preparation of activator and soap solutions. Storage tanks for bulk handling of the rosin soap and modifier were installed with the attendant pumps and piping for handling the solutions. The rosin soap tanks were equipped with low pressure steam coils for heating, which was necessary to reduce the viscosity to a range that could be pumped, and they were insulated. Due to the hazardous nature of cumene hydroperoxide, a separate building was provided for storage and unloading drums of this material. Dinitrochlorobenzene was received as a solid in drums and required melting prior to its solution in styrene. Since contact with this material might cause serious dermatitis, special precautions were taken in the design of the handling equipment to protect the workmen.

For the preparation of activator solution a 5,000 gal. wooden tank (see photograph) was equipped with an agitator and supplied with direct steam heating. Approximately 500 sq. ft. of stainless steel cooling coils for rapid cooling were provided. A rubber-lined solution tank for dissolving the ferrous sulphate used in the preparation of the activator was provided. A storage tank for activator solution was also installed. The soap solution tanks used for regular GR-S were used for the preparation of the cold rubber soap solution. Alterations to the agitation were made to minimize the dissolved air in the solutions.

Flow rates of the butadiene, styrene, soap solution and sodium nitrite solution were controlled by rotameter instruments. Activator solution was measured by an orifice meter which was expected to be the least troublesome on this solution since it was likely to contain a small amount of precipitate. Modifier and cumene hydroperoxide were controlled by small proportioning devices which pumped from weigh tanks. This charging equipment was located in the reactor building in order to centralize control operations. The materials from the feed stream controllers were mixed and passed through a feed stream cooler designed to remove the sensible heat to 41 deg. F.

Reactors used for the polymerization of low temperature polymer were 3,750 gal. glass-lined 125 psi. working pressure vessels agitated by a modified Brumagin type agitator driven by a 6.6 hp. motor. Piping was so arranged that two 12-reactor chains or one 24-reactor chain could be operated. In order to fit these reactors for low temperature service it was necessary to insulate the reactors and connecting lines completely and to change the range of the temperature controllers which govern the chilled brine addition to the jackets so that they operate at 41 deg. F.

In addition to changes in the existing equipment in the reactor and solution preparation areas of the plant, the conversion to low temperature GR-S also required the installation of refrigeration equipment capable of maintaining reactor temperatures of 41 deg. F. Based on formulations found satisfactory for batchwise polymerization, and on production rates comparable to those obtained on regular GR-S, a refrigeration requirement of approximately 800 tons at 0 deg. F. evaporation temperature was calculated for the conversion of 24 reactors. This refrigeration load consisted of the removable of the sensible heat of the reactants from room temperature to 41 deg. F., of the exothermic heat of the polymerization reaction, agitator and pumps, and radiation losses. Based on economic considerations, a reciprocating gas engine ammonia system was installed. Four 400 hp. L-type engine compressor units were installed, one of which was a spare. The necessary evaporators for chilling the calcium chloride brine, which was selected as a coolant, and condensers for the ammonia vapors using cooling tower water, were installed in connection with the compressors. The chilled brine was circulated through the reactor jackets formerly used for cooling water.

Since the production of low temperature polymer was accomplished at a low hydrocarbon conversion (i.e. the percentage of pure monomers entering the polymerization reaction) of 60 percent as compared to 72 percent for regular GR-S, a considerable increase in the amount of unreacted monomers per pound of polymer produced was experienced. Additional vacuum pumps and compressors were installed to handle the increased load. Since the low temperature latex must be heated prior to recovery, direct steam addition facilities were provided.

ACKNOWLEDGMENT

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H_2SO_4 *BUY or BUILD? CHAMBER or CONTACT?*

You need sulphuric acid? If so, you can (1) buy it, (2) build a chamber plant, (3) build a contact plant. Here are economic and engineering facts to help you make the right choice.

JAMES A. BARR

The fundamentals required for a suphuric acid project investigation start with a market survey by a competent analyst followed by a materials analysis with costs. Requirements and specifications, freight rates and competitive prices form the basis for a decision to build or buy.

The usual engineering data should be collected: space available, water, power and labor rates. The company experience and types of existing plants and personnel are quite important while a look into the future is most difficult but necessary.

BUY OR BUILD?

The first step is to answer that question which has plagued many a company—to build or to purchase acid or even to enlarge existing facilities.

If history repeats itself, the pattern of the last 40 years with several boom and depression cycles, indicates that during peak industrial activity, especially during a war, the consumer will need more than his normal quota to make those extra profits or even hold his normal position. The "for sale" supply of acid vanishes and even the regular source fails in supplying the usual quota due to priorities and other causes often beyond the control of the supplier. Prices skyrocket.

On the other hand as during a depression, sulphuric acid floods the market, "new sale" prices drop and the consumer is hard pressed to take his contract quota. It is then much cheaper to build an acid plant on which returns may not at the moment be especially attractive.

It is our general observation and experience over the years that it pays to build if the long range economics are favorable.

The next step is to collect the data necessary to decide on the type, location and capacity of the proposed acid plant.

TWO KINDS OF PLANTS

As a practical limit, we will only consider two types of plants: the contact unit with vanadium catalyst and the water cooled chamber-nitration plant of the Mills-Packard type. These plants are typical of the latest practice in the United States and predominate in new construction. According to the Bureau of Census report of August 1948, the chamber process produced 223,878 net tons acid, (basis 100 percent H_2SO_4) and the contact process 619,444 net tons. The trend toward contact plants has increased sharply.

The air cooled or box chamber type of nitration plant is considered obsolete on account of its first cost and space requirements as compared with the water cooled chamber type.

We will not go into details of process and design. They have been amply covered in many articles and publications. This phase of the project should not be attempted except after long experience.

The limitations of each type of plant will at the outset indicate the proper choice for the proposed project.

HOW ABOUT THE SULPHUR

Brimstone or elemental sulphur such as is supplied from the Gulf Coast region, may be used in either type without any relative penalty.

When smelter or similar gas is the source of SO_2, then either type plant is equally adapted providing the volume and SO_2 content is fairly constant and within the limits indicated below. The recovery of sludge acid is for separate consideration and not a part of this discussion.

The optimum content of SO_2 for gas feed to acid plants is approximately 7 percent; if below this figure then the efficiency of the contact plant drops unless specially designed as noted later. The opposite is true of the nitration plant.

J. A. BARR, *consulting engineer of Mt. Pleasant, Tenn., has had many years of superphosphate and sulphuric acid experience.*

Roaster gases will run on an average between 3 and 5 percent SO_2. Hereshoff roaster gases will contain 3 to 6 percent SO_2 and flash roasters 8 percent SO_2.[8]

When the SO_2 content of gas runs below 5 percent[3] and the volume and SO_2 is erratic then a nitration plant is indicated. With gas below 2 percent SO_2 a nitration-chamber plant works "hard" and increased nitration is required. On the other hand, contact plants are now being designed to operate efficiently on 3 to 4½ percent SO_2 gas.[8]

DUSTS, FUMES AND POISONS

A dust filter and removal system for smelter gas is a requirement for both types of acid plants. A Cottrell precipitator in addition is usually economical for a contact plant. It is our experience that a dust filter, even when burning Gulf sulphur is an advantage in contact plants as this prolongs the operating periods between shutdowns necessary for cleaning the catalyst.

A fume scrubber for volatiles like zinc and catalyst poisoners is desirable in any case; this to be followed by a gas reheater-exchanger in the catalyst bed.

According to the Monsanto Chemical Co., fluorine is the only poison to vanadium catalysts, nominally encountered.

A Cottrell precipitator unit for a 100 ton contact plant converting 7 percent SO_2 gas with a calculated volume of 17,000-18,000 cfm. is estimated to cost between $110,000 and $120,000 in the Southeast.[9] The cost of operation should include not less than 5 percent depreciation, depending upon type of project plus $100 per month maintenance and 10 hp. requirements; attendance by regular plant force.

CONVERSION

The analysis of the relative conversion costs of both types of plants should next be considered. This has been

done in the table presented on this page.[4]

STEAM—AN IMPORTANT FACTOR

A factor that may modify final choice of plant types, is the production of surplus steam by a contact plant. Assuming that the plant steam will be used first to melt sulphur, trace sulphur lines, heat boiler feedwater, operate boiler feed pumps, and allowing 5 percent for blow down, that the following quantities of steam will be surplus and available for plant and process use for which due credit against acid production cost may be taken. Since steam may cost between 40 and 50c. per 1,000 lb., the credit per ton of acid is substantial.

The following is the surplus steam produced in contact plants listed in the table, assuming all equipment is operated by electric power other than that listed above as being steam driven.

If the cost of power and need for process steam warrants, then the blower may be run by a back pressure steam turbine but the surplus steam per hour should be reduced by 10 percent in each size plant.

Plant Capacity Tons	Surplus Steam, Lb. per Hr.	Blower Hp.
25	1,450	35
50	3,090	65
100	6,740	125
200	17,500	250

The comparative costs given in the table show that the 25 ton Mills-Packard conversion costs are 63c. per ton of 60 Be. acid below contact costs, without any surplus steam credit. First costs of both types are equal.

The 50 ton per day conversion costs are 7c. cheaper for Mills-Packard but the first cost $50,000 higher. Circumstances as discussed later could overcome the slight difference so that we consider the choice optional.

If a company has all other plants of the contact type then the choice would be in favor of additional units of the same type. The reverse is true if plants and experience were on the nitration side.[6] The availability of lead burners is essential for present day conditions.

HOW MUCH LEAD?

The question of lead prices is important as a variable in nitration plant costs. A 50 ton per day Mills-Packard plant requires about 150 tons of lead. The variation of lead prices of 10c. per lb. over 1946-48 indicates a variable of $30,000. The scrap recovery at the end of the plant life will be approximately 70 percent of the original weight.

At present the lead refineries will pay 11c. per lb. of lead recovered (fob. refinery). Impurities will vary between 3 and 11 percent. New 12-lb. sheet lead is quoted at 16c. per lb.

ACID CONCENTRATION

Contact plants of less than 25 tons per day capacity are only being built for foreign locations, where a 10 ton unit is often used.

For acid strengths of 97.5 percent and higher, a contact plant is a must as this is the limit of concentrating acid by evaporation and indeed it is not practical to concentrate above 66 Be. or 93.19 percent H_2SO_4. Therefore where 66 Be. acid is required then modern practice indicates a contact plant.

It is possible to concentrate 10 percent of a nitration plant output to 66 Be. in a Glover tower exchanger.

As a general rule it would not pay to tear down a nitration plant with a concentrating unit producing both 60 and 66 Be. acid if both are in good operating condition, and replace same with a new contact plant.

No up-to-date data on the cost of concentrating acid have been made available for publication, however the following costs are indicated.

Plant: direct fired with fuel oil, recuperative tower type, capacity 50 tons per day 60 Be. acid concentrated to 66 Be.

Fuel oil (12 gal.)	$0.50 per ton acid
Labor	.85
Misc. supplies & power	.15
Maintenance	.85
Loss of acid @ $9	.45
Total (no overhead)	$2.30

Operating experience with concentrators is not good and since a contact plant produced 66 Be. or higher acid, there is little interest in this phase of acid manufacture within the scope of this article.

THE ECONOMICS OF SHIPPING

Fertilizer manufacturers prefers 60 Be. acid, as 66 Be. acid is more expensive to dilute, requiring two steps down to the usual plant grade of 55 Be.

The possibility of having a central acid plant to supply surrounding plants and territory is of prime importance to the larger chemical and fertilizer companies. This should be compared with the equivalent number of smaller plants at consuming centers.

The increasing production of elemental sulphur from sour natural gas and metallurgical fumes is a factor in the economics of plant location. These sources should be carefully

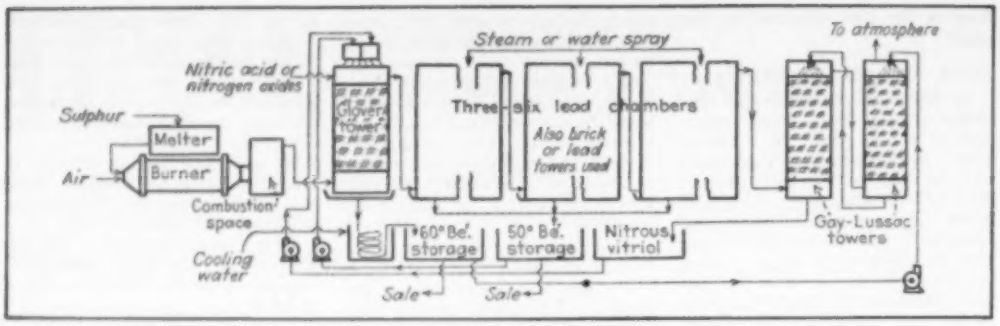
Contact vs. Mills Packard Chamber Plants

Estimated costs of producing 1 ton of 60 Be. H_2SO_4 in contact and Mills Packard chamber plants at Spartanburg, S. C.[1]

Size of Plant[2]	25 Tons 100% H_2SO_4		50 Tons 100% H_2SO_4		100 Tons 100% H_2SO_4		200 Tons 100% H_2SO_4	
Type of Plant	Chamber	Contact	Chamber	Contact	Chamber	Contact	Chamber	Contact
Cost	$225,000	$225,000	$400,000	$350,000	$600,000	$550,000	$920,000	$870,000
Conversion Costs per Ton								
"B" liquor, 25 lb.	$0.380		$0.380		$0.380		$0.380	
Labor[3]	1.100	$1.800	0.688	$0.938	0.413	$0.469	0.241	$0.281
Cleaning up	0.100	0.030	0.100	0.030	0.080	0.040	0.060	0.030
Old-age benefits, unemploy. ins., workmen's compensation ins., vacations, pensions	0.165	0.225	0.103	0.141	0.062	0.070	0.036	0.042
Supplies	0.080	0.080	0.060	0.070	0.060	0.060	0.040	0.050
Repairs[3]	0.563	0.675	0.500	0.525	0.375	0.413	0.288	0.330
Power & lights	0.180	0.240	0.150	0.200	0.120	0.160	0.100	0.133
Supt.	0.220	0.220	0.138	0.184	0.083	0.094	0.048	0.056
Clerk	0.088	0.132	0.055	0.073	0.033	0.037	0.019	0.022
Watchman	0.110	0.150	0.069	0.094	0.041	0.047	0.024	0.028
Taxes & insurance[3]	0.405	0.405	0.360	0.315	0.270	0.248	0.207	0.198
Other expense	0.040	0.040	0.030	0.030	0.022	0.022	0.016	0.016
Depreciation[3]	1.125	1.406	1.000	1.091	0.750	0.860	0.575	0.680
Head office, mfg., pur., traffic, accounting	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Total	$4.636	$5.211	$3.714	$3.793	$2.759	$2.600	$2.114	$1.940

[1] Compiled by O. W. Allen (see ref. 5). Costs include a complete acid plant, plus a short side track, a 250-ft. well in limestone with pump, a 1,300-ton open sulphur storage and a 700-ton sulphuric acid storage. Costs include the use of steam inside the contact plant only. Sulphur is quoted at $18 per gross ton fob. mine. Divide net ton price by 3.70 to get sulphur cost per net ton 60 Be. acid in each case. Some prefer to use 95% as an over-all yield of sulphur or 0.346 tons of 99.5% sulphur per ton of 100% acid produced (T. C. Harris, ref. 4).

[2] 25 tons of 100% H_2SO_4 equals 32 tons of 60 Be. acid equals 10,000 tons per year of 60 Be. acid. [3] A 500-ton per day plant cost $1,500,000. [4] Labor in Mills Packard chamber plant figured at $1.10 per hr.; contact labor at $1.50 per hr. .32 man hours labor per day in each 25-ton plant; 40 in each 50-ton and 100-ton contact; 48 in 100-ton chamber and 200-ton contact; 66 in 200-ton chamber. [5] Yearly repairs: 2½% of chamber plant cost; 3% contact cost. [6] Figured together at $1.80 per $100. [7] Chamber depreciated at 5% per year; contact at 6¼%.



CHAMBER PROCESS, older by far of the two processes, currently turns out about 30 percent of today's sulphuric acid.

evaluated for the present and future trends considered.

It is an axiom that sulphuric acid cannot be shipped very far until it runs into a competitive barrier, which must be modified in the territory of byproduct acid.

The accompanying table of freight rates may be used for estimating purposes. Individual cases will vary and should be checked.

The costs given in the tables are used in the following example calculated to show the relative advantage of a central plant vs. four outlying units. Required: 100 tons per day of 60 Be. acid.

Four 25-ton plants		
Cost per unit, conversion	$4.62	
Total investment capital		$900,000
One 100-ton plant		
Central plant conversion	$2.61	
Total capital investment		$550,000
Differential	$2.02	$350,000

The freight rate on acid for a 100-mi. radius calculated as the average shipping from a central plant is $2.89 per net ton including tax. Since the central plant would be a contact unit the acid would be shipped as 66 Be. to save freight so that the equivalent freight basis 60 Be. would be $2.41 per ton. The conclusion on these facts alone is that there is no economy in concentrating 60 Be. acid or shipping 100 mi. from this central unit. The margin is so close that small lots and other market considerations should be carefully scanned.

If an acid plant is located in water compelled rate territory then the shipping distance for acid into all rail rate area increases before running into a competitive barrier, as was indicated in a recent Midwest survey.

Plant "A" a contact unit with the rated capacity of 100 tons per day of 66 Be. acid, was located on a river front. With sulphur at $18 per gr. ton fob. mines, barge rate $7.07 net ton and using the data from the table: acid cost basis 60 Be. per net ton $8.87

Estimated freight rate 150 mi. on 66 Be. acid basis 60 Be. to plant "B" $3.02

Cost delivered.....$11.89

The prospective customer had a 50 ton per day requirement; Sulphur all rail rate $10.92. Again using the table.

Estimated cost of acid basis 60 Be. $11.03

The investment in plant would be approximately $400,000; if interest is charged at 4 percent, on the basis of 20,000 tons per year, the burden would be $0.80

Total estimated cost.....$11.83

Now the producer by increasing his capacity within permissible limits could probably effect a saving of 20c. per a ton in costs, without additional investment so that it is possible that a sale could be effected.

Shipping Charges

Sulphuric Acid

Mileage rate scale applying between points in Southeast and from Southwest to Southeast. Rates include all increases but not the 3 percent transportation tax.

Miles	Rate, Net Ton	Miles	Rate, Net Ton
25	$1.60	400	$5.21
50	2.12	450	5.63
100	2.81	500	5.91
150	3.32	550	6.34
175	3.66	600	6.62
200	3.81	650	6.75
250	4.22	700	6.90
300	4.50	750	7.16
350	4.93	800	7.32

Sulphur

Freight rates from Texas and Louisiana mines. Rates include all increases but not the 3 percent transportation tax.

Destinations	All Rail, Net Ton	Rail-Water, Net Ton
Tampa, Fla.	$12.20	$5.00 1
Charleston, S. C.	9.55	6.29 1
Baltimore, Md.	13.20	6.79 1
Boston, Mass.	14.40	7.29 1
New Orleans, La.	4.20	3.50 1
Birmingham, Ala.	8.37	....
Cincinnati, Ohio	11.00	6.61 2
Chicago, Ill.	8.20	6.81 3
Houston, Tex.	2.00	....
Texarkana, Ark.	7.00	....
St. Louis, Mo.	7.80	5.19 3
Mason City, Iowa	10.60	....
Minneapolis, Minn.	10.60	7.98 4
Madison, Wis.	9.00	....
Fort Worth, Texas	4.80	....
Los Angeles, Calif.	10.80	....
San Francisco, Calif.	10.80	....

[1] Estimated cost. Includes cost of loading at the origin point and unloading at destination, but not switching, except as shown. [2] Does not include switching at destination. [3] Includes switching at destination. [4] Does not include cost of unloading or switching at destination.

BYPRODUCT ACID

When analyzing the situation within range of byproduct sulphuric acid, the following survey of a requirement set up in the Southeast is indicative. The problem was whether to build a central plant "X" and if so whether to supply two outlying plants "Y" and "Z."

Capacity 150 tons per day cost acid basis 60 Be	$9.70		
Capacity 50 tons per day cost acid basis 60 Be			$11.13
Saving by capacity	$1.43		
	Plant "Y"	Plant "Z"	
Freight from "X" to.	$2.75	$3.66	
Delivered cost from "X" to	$12.45	$13.36	
Freight on byproduct acid to	$5.21	$5.78	

The above data are sufficient to evaluate any quotation on byproduct acid and settle the matter of a plant at location "X" if the saving in production costs of $1.43 per ton of acid is properly credited.

WATER SUPPLY

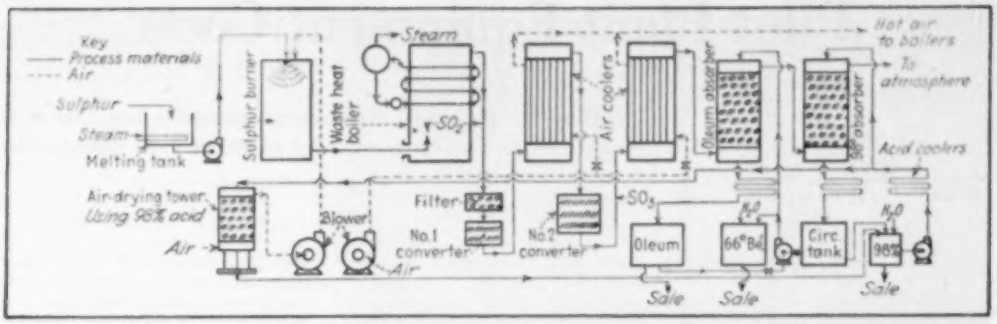
The auxiliary items to be considered in plant location are water supply and public liability.

The water required for a box type chamber plant is the lowest of all and is ordinarily not an important item.

With modern cooling towers and water treatment the water supply for either a cooled chamber or contact plant is not a serious item, except for some locations in the Southwest, if properly evaluated in advance.

For example a 50 ton contact plant requires about 250 gpm. of water if not recirculated.[5] If cooled and recirculated about 50 gpm. of make up water is required, depending on raw water impurities.

[5] F. H. Perrin.



CONTACT PROCESS is commercially 75 years old. This country's 113 plants produce more than 8,000,000 tons of acid per year.

Water pumped from a nearby surface source will cost 3 to 6c. per M gal. or if purchased (in the Southeast), about 20c. per M gal.

In the latter case a cooling tower costing about $5,000[9] erected on purchaser's concrete basin costing about $1,000 to $1,500 with pumps and connections may be used. The operating cost will include approximately 10 hp. for fan tower and pump, plus 2 percent for maintenance and 8 to 10 percent for depreciation.

Water samples should be tested by competent analysts for such items as: scale, usually calcium carbonate or sulphate; corrosion (CO_2, pH, H_2S, absorbed oxygen); iron deposits; biological fouling; effect of operating temperatures.[9]

PUBLIC LIABILITY

A contact plant properly run and designed will not create a nuisance to near by inhabitants, except a short time such as starting the plant "cold" which takes from 4 to 5 hr. for preheating. A shutdown of 15 or 16 hr. does not require preheating. An industrial district with no close up dwelling houses is preferable.

There is usually a short period when SO_3 from the stack will draw complaints from "smog" conscious people and may cause real distress under the right weather conditions. A tall stack with an air injector fan will practically eliminate all complaints. If the absorbing acid is made fuming just before shutting down a contact plant and kept moisture free, SO_2 absorption on starting will be practically perfect.

The "fox tail" or nitre plume from a chamber plant is plainly visible and this aggravates complaints. In the last few years a number of chamber plants have been the target of both vocal and legal action from nearby dwellers.

An injector-fan stack for dispersion is a suggested remedy. There is no cheap, practical absorption system for nitre fumes, though it can be done.

The public nuisance score is about even or somewhat in favor of the contact plant, properly run. It is common experience that a contact plant either runs or it doesn't and requires skilled operators. A chamber plant may get off the beam, still produce and be nursed back to health.

STOPPING AND STARTING

A contact plant can be prepared for short shutdowns in about an hour; simply shut off the burner and blow out the system. For long shutdowns the catalyst should be sealed off, requiring about 8 hr.

To put a chamber plant in standby condition requires about 8 hr. Starting "cold" requires 8 to 16 hr. to reach full capacity depending on outside temperature. There should be no trouble from escaping SO_2.

Contact plants operate at 125 percent capacity down to 50 percent rated capacity with the same efficiency as at 100 percent. They can drop to 30 percent but with a lower efficiency, without having to preheat the SO_2 gas.

A water cooled nitration chamber plant can operate at 20 percent or slightly more over rated capacity. The production can be cut down to 18 or 20 percent capacity by shutting off cooling water or cutting out a chamber, this with some increase in efficiency. At higher rates over capacity, nitration costs increase as well as plant depreciation.

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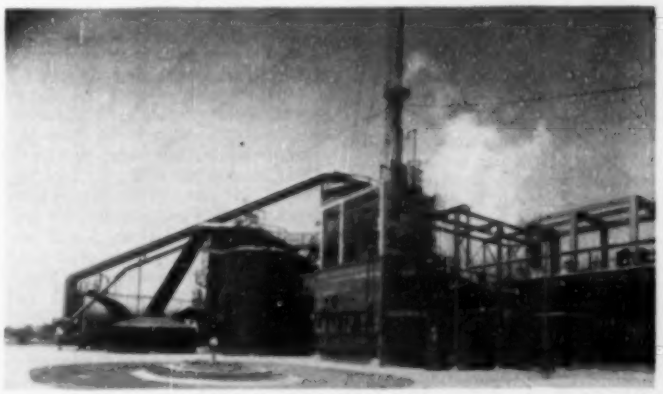

A new contact sulphuric acid plant built by Leonard Construction Co. for Consolidated Chemical Industries, Houston, Tex. (Readers should consult Commodity Survey, p. 337, for more facts and figures on acid.)

Pilot Plant Equipment Costs

Here are data and recommendations for use that will help in figuring costs of pilot plant process equipment.

Henri J. Molaison, Frederick A. Deckbar and Norman C. Cook

NOTE: *Since, and including, our Report on Process Equipment Cost Estimation in May 1947, we have published over 100 pages or enough for a fair sized book on this subject. However, none of this material dealt with pilot plant equipment except insofar as smaller sizes of standard equipment may be used for pilot plants. The material presented here is admittedly based on limited data but is a step in the right direction. Both authors and editors concur in the hope that this initial article will encourage others to publish estimating information of similar character.*—EDITOR.

Cost data for various units of commercial plant equipment have been published, and a commendable correlation of previously published data has been recently made by Chilton (*Chem. Eng.*, June 1949, pp. 97-106), with use of this correlation intended for cost estimation of a new plant. Published information on equipment costs is usually not intended to apply to pilot plant equipment; attempts to use the available curves for that purpose are often unsuccessful in that either the capacities involved are off the curves (or at their extremities), or the pilot plant units are something unusual or non-standard.

In order to obtain unit cost data primarily for estimate purposes in purchasing pilot plan process equipment, a survey was made of such equipment purchases over a 6-yr. period at the Southern Regional Research Laboratory. This survey covered only equipment of carbon steel construction that was designed by engineers of the laboratory and for which detail drawings were furnished to prospective bidders. Engineering design and erection or installation costs have not been included. The equipment was calculated in cost per pound and grouped into four general classifications. A recommended procedure for using the data is included.

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The four classifications of equipment covered by this survey are:

Type I—Welded equipment, involving moderate to much machining. (Example: stripping columns, vapor scrubber, evaporator, dryers.)

Type II—Welded equipment and vessels with jackets, steam coils, etc., involving little or no machining. (Examples: refining kettles, deodorizer, extractor, mixing tanks.)

Type III—Welded single-shell, sheet-metal tanks. (Examples: storage tanks.)

Type IV—Miscellaneous or "left-over" equipment. (Examples: slop tank, cake receiver, nitrogen gas holder.)

Personal judgment was exercised in the classification of many borderline cases. For example, a stack for a Dowtherm boiler was included in Type III, because of approximate similarity of fabrication.

The cost used was the actual, or the awarded, cost; namely, that set by the low or successful bidder, and in some cases the only bidder. It is important to emphasize that in any occurrence of several bidders on the same item, the failure of the successful bidder to have submitted a price would have resulted in a higher cost.

All equipment units except one were fabricated by New Orleans machine or welding shops. The dryer sections (Bid File 353, classified as Type I), were made in Pennsylvania.

The total weight for each unit (or for total number of units included in the particular specifications) was calculated and this weight divided into the cost. In some cases, where the laboratory furnished part of the material, the cost of that part was ascertained from purchase orders and added to the contract cost, the total of which was then divided by the total weight of all parts.

All costs were converted to a March 1948 basis, using the Marshall and Stevens Equipment Cost Index of 158.4 for that month (average for all industries).

Calculations were made for total welding length in every case and a general idea of the amount of machining was included. All calculations were made from the drawings for the equipment, although the equipment itself was inspected for features that may have deviated in any way from the drawings.

The results are given in the accompanying tabulation. The items cover a range of very diversified equipment, with the classification of each item shown. As might be expected, the costs per pound (converted to index 158.4) vary widely.

Based on the data in this table the averages and ranges of unit cost for the four types are shown below:

Type	Number Averaged	Cost per Pound Average	Cost per Pound Range
I	5	$0.770	0.571–0.916
II	7	0.364	0.253–0.518
III	10	0.284	0.161–0.411
IV	2	———	1.118 and 0.827

Only two values were available for Type IV. In view of this and of the fact that galvanized material entered into the constructions, an average was not obtained, for it would be of little value.

In preparing the data, the length of weld per pound of equipment was also calculated. Plots of these values were attempted against cost per pound for each class. For Type I, for the five values on hand, the welding did not vary too inconsistently with the unit cost. For Types II and III, the variation of unit weld length with unit cost did not show any consistent relation. Most equipment involved welds in the order of $\frac{1}{4}$ in. In most cases of the subject design work, size of weld was not specified on drawings, and calculations made on assumptions of welds $\frac{1}{4}$ in. indicated considerable over-design.

RECOMMENDATIONS FOR COST ESTIMATION

Until more data are obtained, the results presented above are recommended as guides in equipment pilot plant cost estimates *following* design.

The following procedure is recommended.

1. Calculate total weight of equipment from drawings. This need be only approximate and in accordance with the views of the estimator on the values of the averages derived in this article.

2. Classify the equipment into the types listed above.

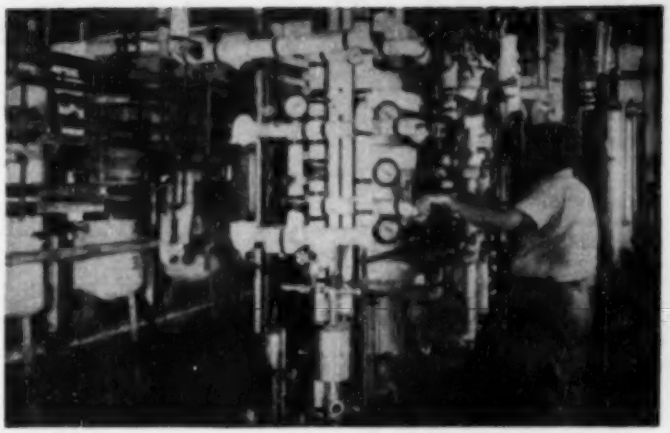
3. Choose the average unit costs for the particular type ($0.770 for I; 0.364 for II; 0.284 for III; use judgment on a high figure for IV).

4. Correct unit cost from index 158.4 to current index.

5. Multiply corrected unit cost by weight of the unit.

6. Apply increased cost factors to all types if the material of construction is other than carbon steel, or if there is an unusual amount of welding and to Type I if there is an unusual amount of machining.

It is hoped that these data (the averaged as well as the itemized data) will be useful not only to estimators in their purchase of designed pilot plant equipment, but also to those who are accumulating and correlating equipment cost information.



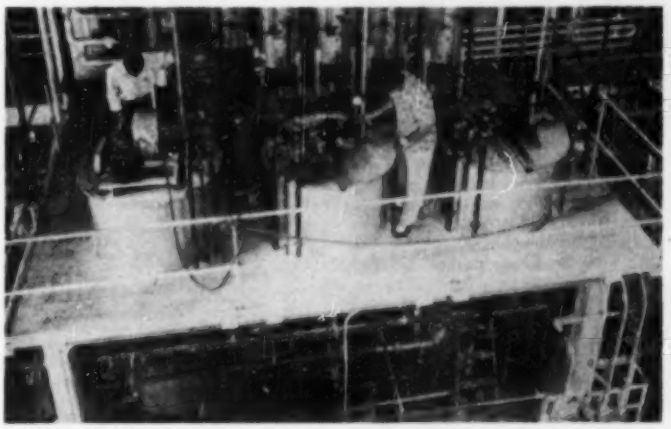
Type I Equipment—Steam stripping column in continuous solvent extraction plant.

AUTHORS' NOTES

Although the list of purchased pilot plant equipment at the Southern Regional Research Laboratory is extensive, the authors wish to emphasize that the averages are based on relatively few data, rather widely spread, obtained only from the items designed wholly by the Southern Regional Research Laboratory and hence not including engineering design costs in the bid price. It is further emphasized that the equipment covered is carbon steel in construction.

Further correspondence is invited from others who may have developed other possibly more accurate methods of estimating pilot plant equipment costs.

The authors are indebted to Joseph L. Hecker for his aid in arrangement of the tabulated data.



Type III Equipment—Slurry tanks in cottonseed fractionating plant.

Material and Fabrication Costs of Pilot Plant Equipment

Bid File No.	Equipment	Purchase Date	Total Weight, Lb.	Cost	Cost per Lb.	Index Ratio Mar. 1945/ Purchase Date	1945 Equiv. Cost per Lb.	Bids Received No.	Bids Received Ratio High/Low	Weld Length, Ft.	Machining Required	Type
88	Stripping column	1942	880.6	$338.60	$0.570	1.580	$0.905	0	3.47	90.0	22 Operations on 6-in. junctions	I
46	Storage tanks	1942	10,992.3	2,860.00	0.259	1.580	0.411	1	1.00	131.6	None	III
118	Storage tanks	1942	4,095.8	792.00	0.192	1.580	0.306	3	1.82	347.0	None	III
122	Settling tanks	1943	8,582.9	1,326.00	0.154	1.576	0.249	2	1.39	507.6	None	III
139	Extractor	1943	3,797.6	809.24	0.160	1.576	0.252	3	1.54	106.2	None	II
141	Elevator sections	1943	229.4	46.15	0.205	1.576	0.323	5	4.22	56.6	None	III
142	Hot well	1943	635.7	65.00	0.102	1.576	0.160	4	4.38	79.7	None	III
146	Storage tank	1943	8,521.7	900.50	0.106	1.576	0.166	3	1.68	344.6	None	III
160	Mixer tank	1943	868.8	213.70	0.246	1.576	0.370	3	1.75	47.7	Shaft and mounting	II
185	Mixer tank	1943	783.2	185.00	0.210	1.576	0.329	3	2.20	88.9	None	II
198	Deodorizer	1943	1,411.6	466.21	0.331	1.576	0.518	3	1.22	40.0	Observation ports	II
236	Tanks	1944	2,045.1	411.00	0.201	1.546	0.2107	7	1.51	148.2	None	III
242	Smokestack	1944	619.6	135.00	0.220	1.546	0.3390	3	1.76	116.3	None	III
269	Vapor scrubber	1945	393.0	190.66	0.485	1.531	0.7450	2	1.49	39.7	Four flanges	I
270	Refining kettle	1945	1,418.0	398.00	0.281	1.531	0.4310	2	1.07	128.4	None	II
286	Evaporator	1946	1,822.0	690.45	0.378	1.501	0.5710	1	1.00	88.7	Four flanges by SRRL	I
295	Stripping column	1945	1,906.5	1,143.00	0.599	1.531	0.9180	4	1.55	250.3	Flanges	I
333	Mixing kettle	1946	1,290.5	348.00	0.269	1.295	0.3430	4	2.39	128.5	None	II
353	Dryer sections	1947	3,349.0	2,376.00	0.709	1.051	0.7460	1	1.00	188.7	Considerable careful fitting	I
356	Mixing kettle	1947	1,286.5	288.00	0.224	1.051	0.2880	6	2.71	128.5	None	II
364	Tanks	1947	4,249.8	740.00	0.169	1.051	0.1780	6	2.41	279.2	None	III
385	Slop tank,* cake receiver*	1948	295.5	314.00	1.060	1.051	1.1140	3	2.46	75.5	None	IV
398	Brine tank	1948	309.0	302.63	0.980	1.000	0.980	1	1.00	69.7	None	III
398	Gasholder*	1948	327.8	196.68	0.627	1.000	0.627	3	1.28	15.2	None	IV

* Galvanized.

"Six Tenths Factor" Applies to Complete

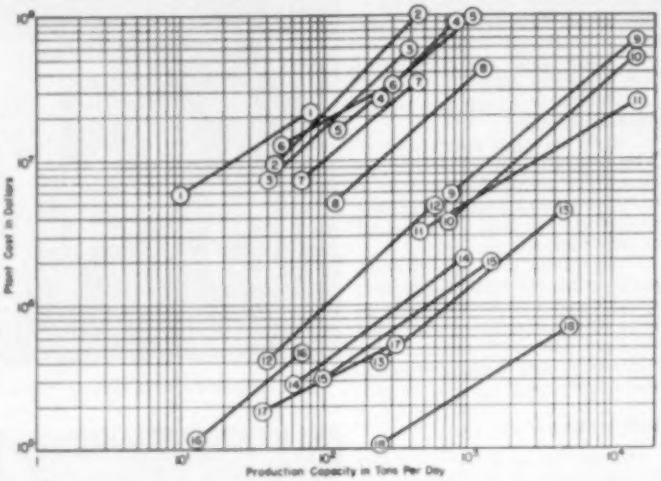
CECIL H. CHILTON

Chemical engineers are frequently called upon to prepare estimates of the cost of constructing process plants in the absence of detailed plant layout and equipment design. Such "predesign" estimates are made at various stages of research and development in order to assist in the direction of research and engineering efforts along channels leading into the most attractive and profitable ventures. The accuracy of this type of estimate will be limited not only by the quality and quantity of process information available from literature, laboratory, and semi-works investigations, but also to a large extent by the cost data available to the estimator. In an effort to assist in overcoming this latter limitation, the author published last year[1] a collection of cost data for various types of chemical process equipment. It is hoped that this previous article will stimulate publication by others of additional equipment cost information, preferably on the same basis of correlation, to fill in the obvious gaps in the present published knowledge.

In most economic studies, management wants to know what will be the capital requirements for a new plant at two or more different levels of design capacity. The smallest economic production volume can thus be gaged, and the estimated effect which increasing volume will have on reducing manufacturing costs and selling prices can be charted to plan long range process development and sales promotion programs. Firm construction estimates for plants of various sizes can always be prepared in the customary manner, based on detailed design and specifications, but these estimates sometimes involve more time and expense than they are worth. There is a definite place in the engineer's tool kit, then, for reliable shortcut estimating methods.

The "six-tenths factor" has found favor as a useful shortcut method for approximating the cost of a piece of equipment when the cost of a similar unit of different size is known. This rule says that the cost at a second size X times the first may be obtained by multiplying the known cost by X.[2,3] In a log-log plot of cost against capacity, you would get a straight line with a slope of 0.6. The published data of Williams[2a, b] and the writer[1] bear out this rule very well for individual items of process equipment. Can the six-tenths factor be applied also to costs of complete plants? If so, the engineer would have a useful and practical tool for the type of economic study described above.

The literature has been searched to see what others might have published on the subject of how plant investment varies with capacity. Williams[2a] and Nelson[3] wrote that plant costs should vary as the 0.6 power of capacity ratio, except when impractically large units or multiple units are required. Neither author gave any supporting evidence, however, other than data on equipment costs. If you assume that plant capacity is increased by enlarging each individual piece of equipment, and that the cost curves for all types of equipment follow the six-tenths rule, and finally, that other related costs (which are much greater in sum than the cost of the basic process equipment) bear the same factoral relation to equipment costs in all sizes of plant under consideration, then you must agree with Williams and Nelson. Things aren't quite that simple, obviously, but the subject is worth a second look. We might find that some of the possible variations will tend to offset one another and that some useful pattern will emerge.



Curve No.	Product or Process	Capacity Basis	Slope	References[a]
1	Magnesium via ferrosilicon	Product	0.62	13
2	Butadiene ex butylenes	Product	1.02	9
3	Aluminum ingot	Product	0.90	13
4	TNT	Product	1.01	2
5	Synthetic ammonia	Product	0.61	2, 21
6	Styrene	Product	0.53	9
7	GR-S copolymer	Product	0.82	8
8	Aviation gasoline	Product	0.88	2
9	Complete refinery including catalytic cracking	Crude charge	0.75	17
10	Catalytic cracking, topping, feed preparation, gas recovery, polymerization	Crude charge	0.88	17
11	Topping and thermal cracking	Crude charge	0.60	17
12	Contact sulphuric acid ex smelter gas	Product	0.91	7, 21, A
13	Two coil crude oil cracking	Crude charge	0.82	22
14	Solvent dewaxing of lube oil	Lube fraction charge	0.74	18
15	Solvent extraction of lube oil	Lube fraction charge	0.68	18
16	Catalytic desulphurization of gasoline	Gasoline charge	0.81	17
17	NaOH purification via ammonia	NaOH product	0.48	24
18	Atmospheric crude oil topping	Crude charge	0.62	22

[a] References are numbered as per bibliography at end of paper. "A" indicates anonymous news releases; individual items were usually listed in several different papers and magazines.

These charts show how the cost of a plant will vary as you change its size. For most of the 36 types of plant

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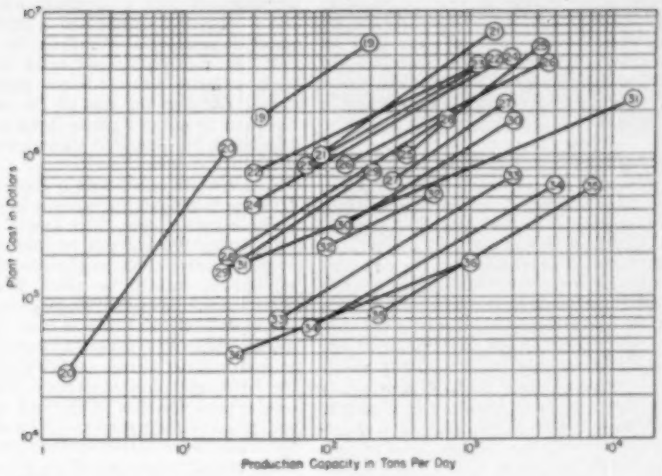
Plant Costs



Curve No.	Product or Process	Capacity Basis	Slope	References*
19	Ethylene ex refinery gas	Product	0.67	23
20	High-purity oxygen	Product	1.39	2, A
21	Thermofor catalytic cracking	Gasoline	0.71	12
22	Low-purity oxygen	Product	0.47	4, A
23	Low-purity oxygen	Product	0.59	20
24	Low-purity oxygen	Product	0.57	5, 6, 9, 19
25	Catalytic cracking	Gasoil charge	0.81	17
26	Natural gasoline	Natural gas charge	0.51	18
27	Delayed coking of petroleum	Reduced crude charge	0.73	17
28	Contact sulphuric acid ex brimstone	Product	0.63	2, 7, 11, 21, A
29	Catalytic polymerization of refinery gas	Poly gasoline and LPG	0.66	17
30	Thermal cracking	Crude charge	0.63	17
31	Hypersorption	H_2-CH_4-C_2H_4 charge	0.42	18
32	Thermal cracking	Crude charge	0.49	10
33	Vacuum distillation of lube oil	Lube fraction charge	0.60	18
34	Crude oil topping	Crude charge	0.52	18
35	Vacuum flashing of crude oil	Crude charge	0.58	18
36	Hydrogen sulphide removal from natural gas	Natural gas charge	0.33	18

* References are numbered as per bibliography at end of paper. "A" indicates anonymous news releases; individual items were usually listed in several different papers and magazines.

plotted, the slope is reasonably close to 0.6—that is, if you double its size it will cost $2^{0.6}$ times as much.

Many engineers have probably used a simple estimating shortcut on numerous occasions without realizing its mathematical significance. This rule-of-thumb says that doubling the capacity of a proposed plant will involve a 50 percent increase in cost, or that trebling the capacity will double the investment. If we calculate from these figures the exponents (or logarithmic slopes) which they imply, we get:

$\log 1.5/\log 2.0 = 0.176/0.301 = 0.584$

and

$\log 2.0/\log 3.0 = 0.301/0.477 = 0.631$

The closeness with which these exponents bracket 0.6 seems very significant. This method of approximation was illustrated in an article by Wade[8] concerning the economics of polymerization units in natural gasoline plant operations. He estimated that the cost of a plant designed to handle 2,000 bbl. per day "would probably cost not over 150 percent" of that of a 1,000-bbl. plant.

Increasing plant design capacity by enlarging every piece of equipment an equivalent amount is probably more the exception than the rule. In small plants, some equipment will be larger than necessary because sizes designed to fit actual requirements would be too small to be commercially available. The first increment of increased design capacity will, therefore, be achieved mainly by increasing the sizes of only certain critical items, or bottleneck breaking. On the other hand, the opposite may be true in the very large sizes. Here you run into problems of obtaining equipment larger than that commercially available or beyond the limits of shop fabrication and rail transportation. Over the whole range of sizes being considered, various items such as storage capacity, spare equipment, waste disposal, and so on, will bear no fixed relation to plant capacity. For instance, in a large plant a proportionately greater heat exchange surface may be justified in order to obtain a higher thermal efficiency than would be economical for a small plant. Or the smaller plant may be able to dispose of process wastes into nearby surface waters, whereas on a larger scale a treatment plant would be required. As capacity requirements increase, moreover, a point is reached where, for various engineering, economic, and administrative reasons, multiple units or entire duplicate plants are preferred to further increases in equipment sizes.

The assumption that individual items of equipment follow the six-tenths rule has been found to be valid to a remarkable degree. Here again, however, exceptions are to be expected. As pointed out previously,[9] noticeable deviation is exhibited by high speed rotating equipment, such as pumps, fans, and centrifugals. Cost curves on these types of equipment show a lesser slope in the smaller sizes, passing through 0.6 slope in the intermediate range, to a greater slope for the larger sizes.

Even if process equipment costs did follow a definite relation to plant size, you still could not assume that everything else entering into cost of a complete plant would follow a similar relationship. This is quite important, too, because costs of building, piping, and other facilities constitute a major fraction of the total plant cost. These costs are proportionately greater for small plants than they are for large plants.

Almost as much money is involved in engineering expense to design a 10 ton per day plant as would be to design a 50 ton per day plant, for example. And, as pointed out by Harris,[10] such things as instrument costs for pilot plants are out of line with those for large plants. In the development of a system for relating these other, but just as essential, items of plant cost to the cost of process equipment, Lang[11] illustrated this effect very nicely by tabulating his breakdown of costs in accordance with plant size.

Summarizing the above discussion, we can now postulate some general principles:

1. Changes in design capacity will influence the number, sizes, and types of process equipment required, but not necessarily in proportion to the capacity change.

2. Costs of individual items of process equipment will vary more or less as the 0.6 power of the capacity ratios, over a broad middle range of sizes.

3. Costs of all other related facilities and expenses will, in general, decrease in proportion to total equipment cost as design capacity is increased.

4. Practical considerations limit the sizes of individual pieces of equipment as well as sizes of complete plants.

If conditions favor rules (2) and (3), we might expect complete plant costs to vary by some power factor less than 0.6. If rule (4) prevails, this factor will approach 1.0. If rule (1) dominates, however, anything can happen. Let's see what can be learned from a study of published information on plant costs.

Data on complete plant costs from a number of sources have been assembled, correlated, and plotted as shown in the accompanying graphs. Capacity ratings cover the range of 1.5 tons per day to 15,000 tons per day, and costs run from $30,000 to $100,000,000. Thirty-six separate "curves" are shown, all of which, however, are best represented by straight lines. All costs have been corrected to an ENR index of 400 (spring 1947) to agree with the basis used in the previous paper.[6] Where capacity ratings expressed in original sources were in some units other than tons per day, suitable corrections have been made, based on a 365-day year and estimated specific gravities for conversion of barrels and cubic feet to tons. Capacities of some of the plants are expressed in terms of charge rather than product because of difficulty in designating a definite yield of a single product as a basis of capacity rating.

Petroleum refinery plants predominate in the list of those included in this study. There are three reasons for this: (1) construction activity in this field has been high, (2) costs have been published rather freely, and (3) Nelson has recently published [17, 18] two sets of curves, eight to each set, on refinery and similar plant costs. Along with some earlier cost correlations by Nelson,[16] Smoley,[20, 22] and Kelso,[19] the petroleum field is well represented.

Another major source of information was the published cost data on government war plants. Gilliland and Lavender[8] reported on plants comprising the synthetic rubber program, Klagsbrunn[10] covered the DPC aluminum and magnesium plants, and a Chem. & Met. Report[5] supplied costs of government plants built to produce TNT, ammonia, aviation gasoline, high-purity oxygen, and sulphuric acid. Postwar interest in low-purity tonnage oxygen has encouraged publication of several sets of estimated costs for various sizes of plants.[2, 3, 13, 20] Another reference [21] estimated the required investments at several scales for a recently developed process for purifying caustic soda. Other spot data from miscellaneous sources were used to define a plant cost curve for sulphuric acid ex smelter gases and to support the curves from the more extensive sources.

These curves can be best analyzed by studying their slopes, which are listed in the accompanying table. Slopes range in a fairly smooth progression from 0.33 to 1.02. (The single freakish value of 1.39 will be considered separately.) The average slope is 0.68 and the median is 0.66. Closer inspection reveals what appears to be a perceptible jump in the progression of slopes from 0.82 to 0.88. If we assume that this break marks the point where multiple unit plants begin to predominate and eliminate these higher slopes from our calculation both the average and median values figure out to be 0.62. This assumption should be good for at least two of the curves, since it is well known that TNT and aluminum plants are predominantly composed of multiple units.

Can we conclude, based on this evidence, that costs of complete process plants follow the six-tenths rule? Can this rule be safely employed in economic studies based on predesign cost estimates? The writer believes we can answer yes to both questions. With a bit of consideration as to the probable method of obtaining capacity increases, the power function might be estimated even more closely for specific cases. As an example, a Bureau of Mines report[3] estimates the costs (corrected to ENR-400) of plants for production of manganese by an electrolytic process according to this schedule: Cost of 10 tons per day plant with no allowance for expansion = $1,200,000. Cost of 10 tons per day plant with general facilities designed for ready expansion to 40 tons per day = $1,780,000. Cost of 40 tons per day plant = $3,400,000.

(a) No allowance for expansion:

$$\frac{\log (3{,}400{,}000/1{,}200{,}000)}{\log (40/10)} = 0.452/0.602 = 0.75$$

(b) With allowance for expansion:

$$\frac{\log (3{,}400{,}000/1{,}780{,}000)}{\log (40/10)} = 0.281/0.602 = 0.47$$

Where a plant is expected to expand rapidly with the economic success of the process or product the latter procedure involves a lower over-all cost, because the expansion can be accomplished with a minimum write off of existing facilities and a minimum disruption in operations. In a case like this you would make the basic estimate for the large plant, scaling down to the cost of the initial plant by use of a power factor applicable to the projected construction program.

The freakish curve with a slope of 1.39 represents data for wartime high-purity oxygen plants. The source of information[2] did not give any details on plant construction, so an authentic explanation cannot be given here. Several possibilities can be suggested, the most likely of which is that the smaller plants were designed to utilize general facilities already available and the larger units had to provide their own general facilities. A detailed investigation of these costs might be enlightening but would contribute little to the over-all picture which the writer has tried to present.

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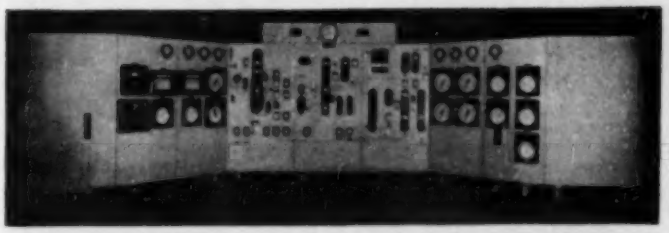
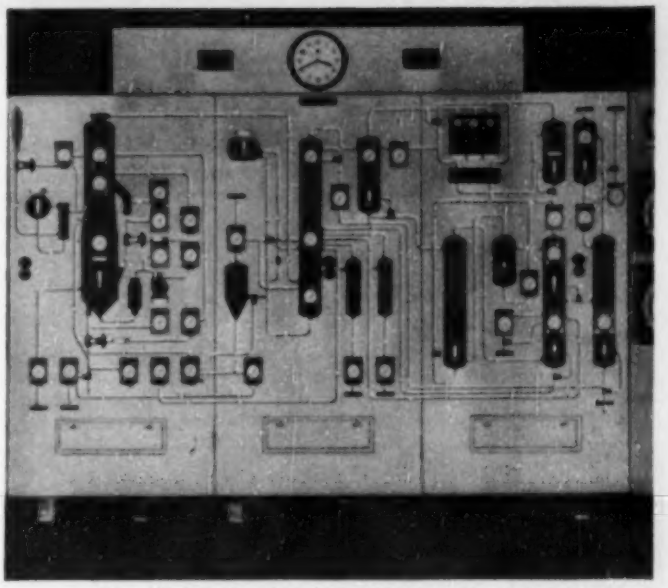
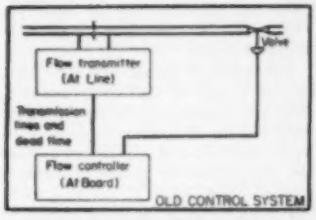
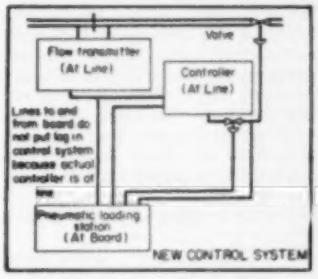
New Graphic Control Panels








Valve
Flow transmitter (At Line)
Controller (At Line)
Lines to and from board do not put lag in control system because actual controller is at line
Pneumatic loading station (At Board)
NEW CONTROL SYSTEM

NO TIME LAG IN NEW SYSTEM

NO LONG ROWS OF BLACK BOXES TO CONFUSE OPERATORS

They eliminate two serious objections to centralized control

The trend in the process industries has been to centralize control of a process at one central point instead of leaving the controls out in the field at the point of measurement. However, as processes become more complicated and plants become larger, two drawbacks grow more and more apparent.

The first drawback is the row on row of black boxes housing the instruments; they are quite confusing to new operators even though they all bear name tags. The operators not only have to learn the point of control in the field but also have to learn its place in the control house.

The second drawback is a sacrifice in the degree of control when transmission and control lines run long distances between the process control point and the control board. This is particularly bad in rapid process controls such as flow and pressure.

In the past year Universal Oil Products Co. has designed seven plants (five of which are in operation) which seem to overcome these two drawbacks to the centralized control panel without sacrificing any of its advantages. The new plants have a "graphic control panel" for the control of the process.*

The new system is in effect a control panel with a simplified flow plan of the process located on it. The control stations of the process are physically located on the flow plan at the point that they are controlling or indicating. The operator is therefore able to see the relationship of each controller to the other controllers as well as to the over-all process (eliminating the first drawback). In the case of the very fast processes, where large transmission lags exist, the actual controllers are located in the field, preferably near the valve, and have their control points reset from the control station at the panel (eliminating the second drawback; compare drawings). The control station also contains switches which can be used to place the process on manual control from the control board.

The graphic control panel has other advantages: it is considerably smaller than the conventional panel, being about half as long but containing the same amount of instrumentation; it is usually shop-fabricated instead of field-fabricated, which gives a better-looking job and saves field construction time.

Most of the major instrument companies have recognized the new trend in process instrumentation and either have equipment for use on graphic panels or expect to in the near future. A plant designer will soon have available to him just about as wide a choice of suppliers as he now has in conventional instruments.

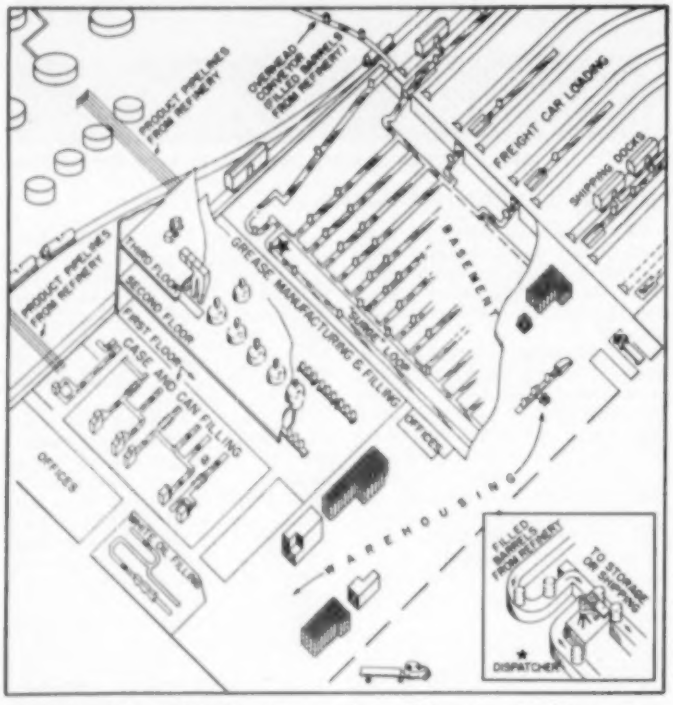
* Rock Island Refining Co., Indianapolis, Ind.; Old Dutch Refining Co., Muskegon, Mich.; Cosden Petroleum Corp., Big Spring, Tex.; Globe Oil and Refining Co., Lemont, Ill.; Wood River Oil and Refining Co., Hartford, Ill.; Deep Rock Oil Corp., Cushing, Okla.; Indiana Farm Bureau Co-op Assoc. The new control panels are not yet operating in the last two plants.

GREASE PLANT AND PACKAGING CENTER

7½ acres of smart ideas: Pushbutton conveyor system, clean way to handle graphite, spontaneous brake for roller conveyors, air motors for grease pumps, variable speed a.c. motors for high-torque agitators.

J. V. HIGHTOWER

Standard of California's huge packaging and grease plant. It handles over 1,200 different products, virtually everything the company puts in packages.



Pipe bridges bring products from all over refinery. High section of building is where grease is made, balance is mostly packaging and warehouse.

In its refinery at Richmond, Calif., located in the San Francisco bay region, Standard Oil Co. of California has one of the most modern grease plant and packaging installation in the country. The reinforced concrete building covers about 7.5 acres of ground space, and is the refinery's centralized point for the final processing, packaging and shipment of compounded lubricants, greases and specialties. The new plant has numerous features in processing equipment and the handling of materials. These reduce costs and speed the filling of orders.

The enlarged grease making capacity is well over 30 million lb. per year, although depending to some degree on the types of greases required. Calcium, sodium and aluminum greases are the dominant products in this line.

A major reason for construction of the centralized project lies in the fact that the refinery at Richmond manufactures over 1,200 different products, distributed in both bulk and packaged form. Packages range all the way from four-ounce containers to 55-gal. steel drums. Because a high proportion of these products are marketed in packaged form, the company decided to centralize and modernize the handling of packaged products.

The visible result is a massive building, three stories high in the manufacturing section. This one building houses equipment for the making of soaps used in the greases, facilities for both batch and continuous grease making, the manufacture of compounded oils and specialties, storage of raw materials, units for filling containers with products manufactured inside and outside the building, an extensive system of conveyors to shipping stations, a warehouse section, offices for the supervisory staff and the accounting group, and lunch and locker room facilities.

Many of the packaged products are made in this building. Others, manufactured elsewhere in the refinery, are filled into containers in the building. Still other products are delivered here in packaged form. However, the building is the focal point for packaged products on their way to their final destinations.

The building, from basement to the top floor, is painted in colors restful to the eye and is kept free of dirt and

J. V. HIGHTOWER is West Coast editor of Chemical Engineering.

other possible contaminants for two reasons. One is to avoid contamination of the finished products. The other is to encourage what may be simply called "pride" on the part of the management and operators. The building is notably clean and free from odors characteristic of old-time barreling and grease plants.

CASE AND CAN

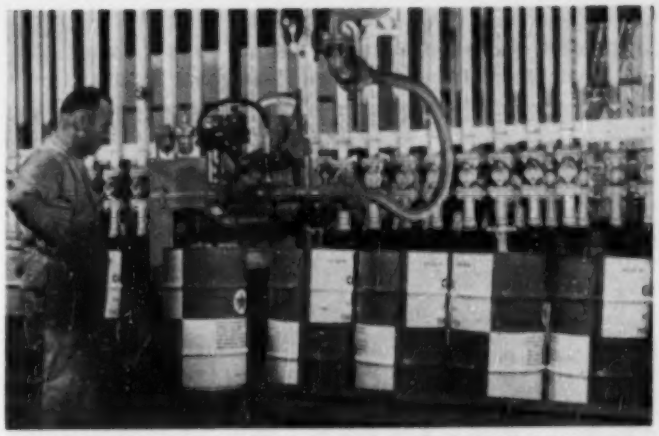
A large section of the building, called the Case and Can Filling Room, occupies about an acre of floor space; it is the area where products manufactured elsewhere in the refinery and conveyed to the room by pipe-lines are filled into containers. Over 100 different products are filled, labeled, stencilled and sealed in cartons here. The movement of containers from point to point is performed on conveyors. The conveyor system is interlocked in order to reduce the amount of equipment needed for sealing cartons and nailing cases. Since containers may go out unpackaged or in cartons and wooden cases, it is necessary for each conveyor line to be able to handle any type. By integrating the system it was possible through scheduling of fillings to use a minimum of sealing equipment.

Eight filling units, adapted to containers ranging all the way in size from less than a quart to over five gal., are installed. A new type of machine, used for cans of one to five gal., employs automatic air valves that close when the predetermined amount of oil enters a container on a scale platform, causing the platform to sink and actuate the valve. As this occurs an indicator discloses to the operator any surplus or deficiency, in units of ounces. This system takes the place of older equipment that made it necessary for the operator to perform check-weighings.

Fully automatic filling equipment is used for filling white oil into pint and quart bottles. This equipment consists of an unscrambling table, an automatic bottle cleaner, automatic filler, automatic capper, automatic labeler and two carton sealers. Average daily capacity is 15,000 pint or quart bottles each eight hours. For comparatively small fillings of white oil into cans of 1 to 5 gal., a two unit volumetric filler having a capacity of 1,600 containers each eight hours is used.

MANUFACTURING AREA

Turn now to the manufacturing area of the building, the section that occupies three floors. In this depart-



Small drum filling station. Centralized packaging saves time and mistakes in preparing orders and makes it practical to use a lot of labor saving devices.

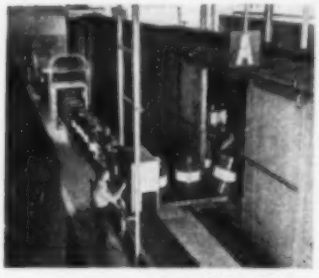
Special scale for palletized drum filling. Pallet of four drums stands on scale section of conveyor. Each drum is weighed separately as it is filled.

Grease mixers. Clean and efficient, they bear little resemblance to old-time barreling plant. Box attached to charging truck, top left, is weigh hopper.

Dispatcher pushes buttons as barrels pass. Automatic controls throw right switch at right moment

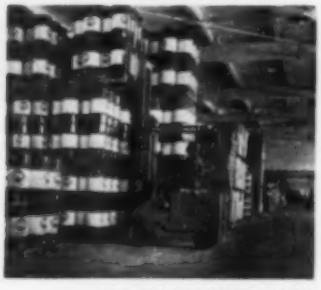
DISPATCHER CONTROLS ENTIRE SYSTEM, CAN SEND BARRELS . . .

Mile-long conveyor system. It handles 20 barrels a minute.

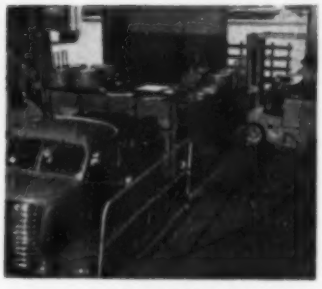


. . . TO FREIGHT CARS

. . . TO LOT-ASSEMBLY SPURS



. . . TO WAREHOUSE AREA



. . . TO TRUCK LOADING

ment are produced approximately 200 different products: greases, cutting oils, soluble oils, gear lubricants, waterproofing compounds, detergents, floor waxes and sprays.

The third floor is primarily a storage area for raw materials, such as soap stocks and additives. On that floor, the materials are dumped into bins extending through the floor. Ten of the bins are for liquid stocks and eleven for powdered and granular materials. On the second floor the discharge ends of the bins are operated manually by operators who release the material into weighing hoppers supported on small powered trucks which are used to carry the product to the mixers and discharge it. Water and liquid petroleum base stocks are metered into the mixers from pipelines from the refinery.

The grease manufacturing equipment includes ten new pressure-type mixers equipped with double action blades and ranging in capacity from 10 to 75 bbl. each. Six mixers of an old type have been converted to individual drive for use in making greases not requiring more modern equipment. In an inclosed room is a Dowtherm-heated mixer for making greases requiring temperatures above 350 deg. F. This unit consists of a vaporizer, surge tank, Dowtherm storage tank, vacuum system and a 40 bbl. mixer. Six of the old type mixers with alterations and individual drives are used for making specialties and lubricants. There are two mixers for graphite and white lead slurries. Soap is manufactured in two steam jacketed, pressure type soap mixers operating at 300-350 deg. F. Capacity of the soap units is about 20 bbl. each.

Mixers are closed at the top and have outlets leading to a ventilating system to keep the room free of vapors and odors. Three mixers used in making products containing flammable thinners at elevated temperatures are installed in a separate chamber with a fire door. Electrical equipment in the chamber is explosion proof.

A feature of mixers with variable speed agitators is the use of a.c. wound-rotor motors, an arrangement that permits the torque to be maintained when speed is reduced. Grease mixers, specialty mixers and the soap mixers are fitted with automatic shutoff valves for stopping the entry of liquid raw materials at predetermined points. Noteworthy is the use of air driven motors that actuate gear pumps used to discharge grease from mixers into containers, which in a short period of operation may range in size from small cans to 415-lb. drums. The use of air drive makes possible the close control of discharge of grease at widely variable filling rates. On mixers producing more fluid products, the conventional electric motor driven pump is used.

SPECIAL SCALE FOR PALLETIZED FILLING

As all storage is done by palleting, the container-filling units have been set up so as to use pallets as much as possible. The barrel filling units, for example, have short conveyors on each side of the filling unit, one side being for two pallets of empty barrels and the other side for two pallets of filled barrels. The scale itself holds a pallet of barrels. The scale is of special design which allows setting the scale to zero after setting the tare weight of the empty barrels and the pallet. The barrels are then filled to identical weights, one at a time, until all are filled. Weight control is afforded by individual balance bars for each barrel. When each barrel is filled, its balance bar is tripped and the scale dial returns to zero.

GRAPHITE SPRAYER

An interesting process, which also is a company development, is used to apply a thin coating of graphite to sticks of rod grease. Graphite is applied to this product to keep the sticks from sticking together after they are packed in boxes, and also to facilitate movement of the sticks through the equipment by which the customer applies the grease. The former practice was to coat the sticks by hand, a dirty method.

In Standard's process the sticks, after being extruded from a cylinder with air-driven piston through a die head at the end of the cylinder, are manually cut to the desired length and then laid upon a belt which carries them into a spray housing where they are sprayed from all sides with a water-graphite emulsion. On emerging on the belt from the housing they are dropped upon a second belt that carries them through a chamber where they are dried by electrical heating. Received at the other end of this chamber the sticks are then packed in boxes.

The company is also manufacturing aluminum stearate greases in the building, and for this purpose uses a semi-continuous mixer. This equipment, rather than a batch mixer, is used because of advantages that continuous operation offers in the way of close control of quality. Capacity of the unit is around 17,500 lb. per eight hours.

Oil and the aluminum soap are fed into one of the two motor agitated slurry tanks equipped with a vacuum system for the removal of air. The slurry is discharged into a steam or Dowtherm heated Votator and brought up to the temperature required by the particular type of mixture, agitated for the desired time and then discharged through a water-jacketed Votator to be cooled to around 180-220 deg. F. The cooled product is pumped to a unit of four gel tanks where it is permitted to set for the necessary period. As the final stage in the process the product passes through a homogenizer and is packaged.

MILE-LONG CONVEYOR

The company developed a modern, highly coordinated conveyor system, featured by an electronic dispatch room for moving large drums of products to shipping docks or storage. These particular filled drums are brought into the building at a rate of one every three seconds. At this rapid rate the drums approach the dispatch room, where a single operator registers each drum's destination on an electronic push button panel. This control not only routes each drum to the proper spur conveyor that carries it to its destination but also tabulates the number of drums diverted to each spur, so it will be at once apparent to the dispatcher when all the drums required for that destination have been accumulated and are available for loading. At that point the loading crews are automatically flashed a signal and the group of drums is withdrawn to the loading area, leaving the conveyor spur available for accumulating another group for another destination.

As the destination of each drum is registered by the dispatcher, an impulse is sent from the control room to provide that when a drum destined for a given spur reaches a point on the main conveyor opposite that spur, a pneumatic diverter ram switches the drum onto the spur. This action may occur only a few seconds after the drum has been registered, or it may be several minutes later, and any number of drums may be diverted consecutively onto the same spur. If the spur to which a drum is assigned is filled, or if drums are received for which there is no spur available, the drums automatically go into a recirculating loop and are held there until required.

There is a continuous flow of drums to the loading area over the conveyor system. A full drum once put onto the conveyor at the filling plant in the refinery is not removed from the conveyor until it has reached its particular destination, which may be a railroad car, highway truck or the central storage warehouse. Since the extensive conveyor system is installed beneath the warehouse floor proper, it does not impede the movement of stocks to and from the warehouse. The outlets from the conveyor system are brought up to warehouse floor level at the shipping points.

Simultaneously with the movement of drums over the conveyor system, other drums, cased products and empty containers are being assembled from the warehouse floor space and transferred to filling or shipping points. This movement is performed by powered fork-lift trucks, which place the stock on trailer trains towed by tractors.

With reference to the roller-type spur conveyors described above, these are installed on a slope leading from the main conveyor and drums move over them by gravity. The company developed an ingenious method (patents pending) of preventing drums from gaining velocity on rolls still revolving and thereby colliding with drums ahead. Each roll has small angle irons running the length of the roll and welded against the interior wall. The roll is about half full of potassium carbonate solution (about 1.5 sp.gr.). As the roll begins to revolve, the heavy water solution drags against the internal vanes, thereby exerting a braking action against the rotation. Potassium carbonate was selected because the solution is heavy, non-corrosive and relatively inexpensive.

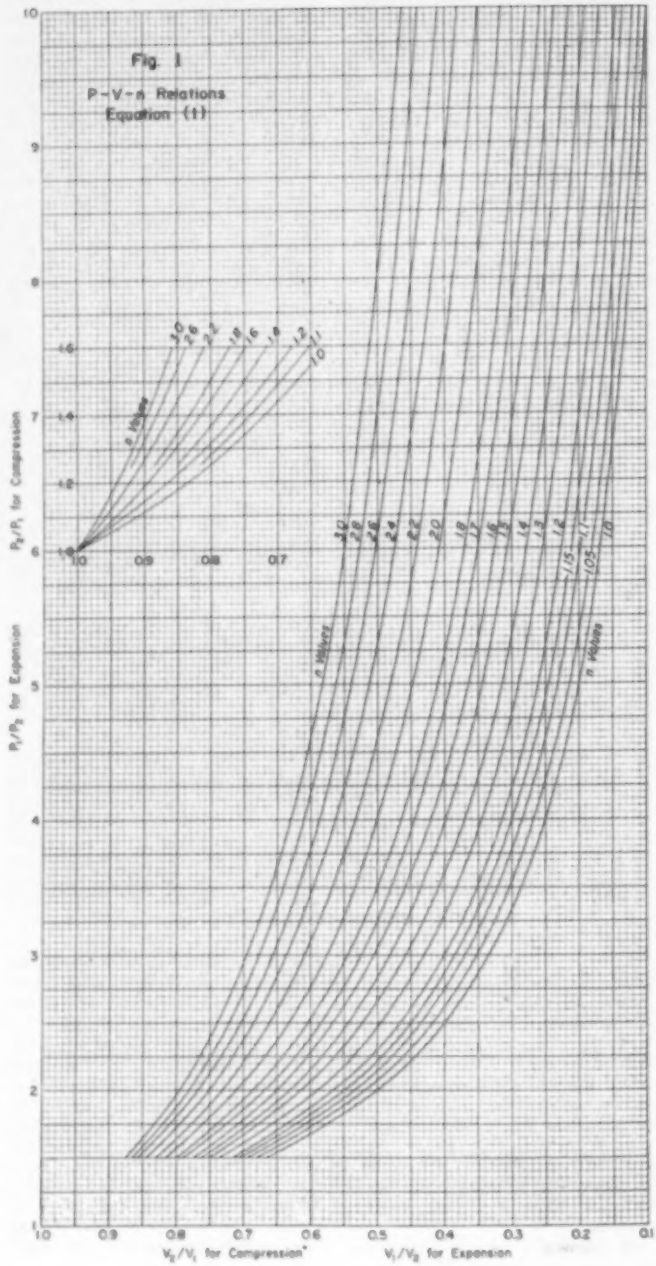
Charts Solve Polytropic P-V-T Relations

WILLIAM T. RICE

Engineers are always anxious to speed up and simplify calculations, particularly if these are of laborious, tedious and repetitive type. Graphical solution of equations, especially those with exponential functions, always reduces the time required and, with proper graphical aids, does so without loss in engineering accuracy. Good examples of the sorts of calculations for which graphical solution is well adapted are the polytropic pressure, volume and temperature relationships of gases. The aim of this article is to present charts that are satisfactory for this purpose.

Many processes of compression and expansion of the so-called perfect gases can be—and are—approximated by the equation of process, $pv^n = a$ constant, and the equation of state, $pv = RT$, where p is pressure, v is volume, R is the gas constant and T is absolute temperature, all in consistent units. The exponent n is a function of the character or manner in which the compression or expansion is taking place.

To make this clearer, if we are dealing with the compression of a perfect gas and plot the p-v relations on a pressure-volume diagram, we will obtain a family of curves for the various values of n, as shown by Karassik in *Chem. Eng.*, Oct. 1947, p. 111. Specific values of n represent specific characters of the compression process. For instance, when $n = 1$ the compression is isothermal, that is, the heat of compression is removed during compression so that the temperature of the gas remains constant. Similarly, when $n = k$, the compression is adiabatic, that is, no heat is either added to or removed from the gas from an external source during the compression. Here k is the ratio of specific heat of the gas at constant



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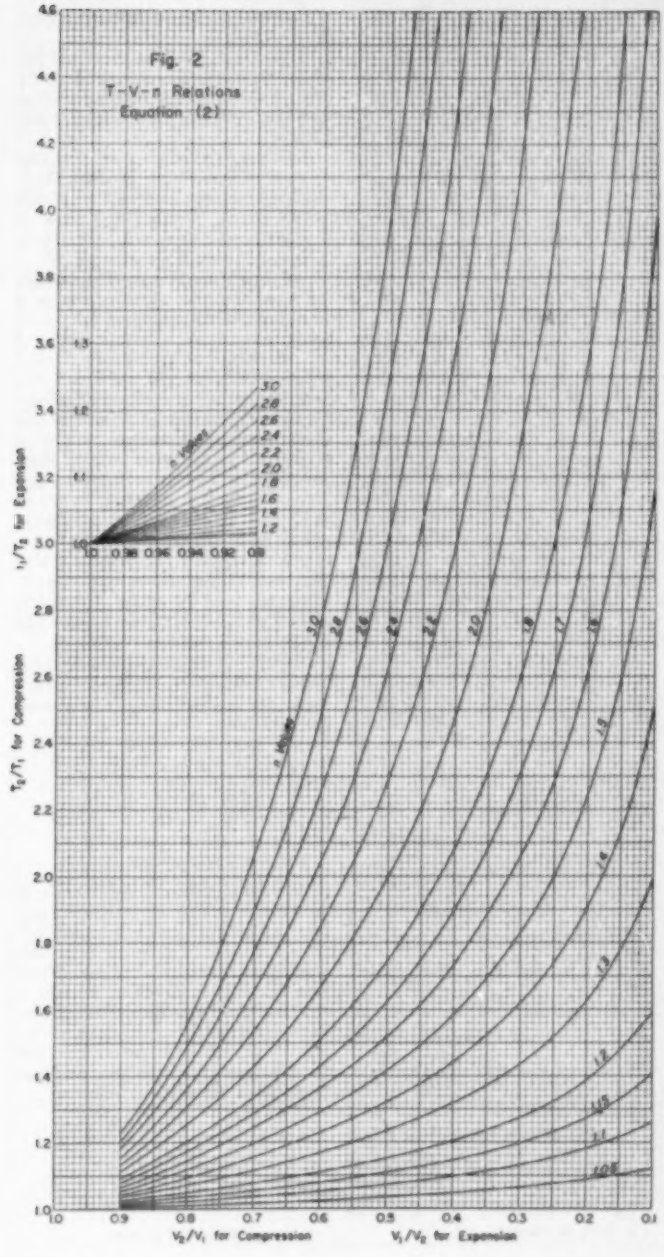
For the Perfect Gases



pressure, to the specific heat at constant volume.

For other values of n the process is called polytropic, denoting that heat is added to or removed from the gas during the process. The removal of heat is generally in the form of external cooling, while the departure from adiabatic compression in an uncooled process is the result of the inefficiency of the process itself. That is, some of the energy supplied for compression is converted into heat. In such cases the exponent n is greater than k.

From the fundamental relations given above, equations can be derived which permit the calculation of the conditions of state of a gas during or after compression or expansion has taken place. These equations, which are well known, relate pressure, volume and temperature conditions at the initial and final states for any given n value. In them the subscript 1 indicates the initial and the subscript 2 indicates the final condition in either compression or expansion. The equations are:

$$P_2/P_1 = (V_1/V_2)^n \qquad (1)$$

$$T_2/T_1 = (V_1/V_2)^{n-1} \qquad (2)$$

$$T_2/T_1 = (P_2/P_1)^{(n-1)/n} \qquad (3)$$

As already noted, these equations apply strictly to the perfect gases which follow the relation $pv = RT$ and for which the compressibility effect is either negligible or disregarded. (For the effect of compressibility on the compression and expansion of real gases, see Worthington Research Bulletin P-7637, "Compressibility Charts and Their Application to Problems Involving Pressure-Volume-Energy Relations for Real Gases.")

Occasions often arise when a great number of calculations with these equations must be made, clearly a case for graphical solution. The three large diagrams given here solve these equations and do so more readily and with less chance for confusion than the nomographs sometimes used for the purpose. (For example, see Mapstone, *Chem. Eng.*, Mar. 1949, p. 142 —*Editor.*) The first diagram, Fig. 1, solves Eq. (1), while Fig. 2 represents Eq. (2) and Fig. 3, Eq. (3).

These three charts will assist the engineer greatly in handling his compression and expansion problems. For example, given an adiabatic or polytropic process, Figs. 1 and 3 easily give the end volume and temperature. Given the ratio of compression and the actual discharge temperature, it is easy to determine the polytropic exponent n, from which the polytropic and adiabatic efficiencies e_p and e_a of the process are readily calculated. (For

a discussion of these efficiencies see Karassik, Process Engineer's Guide to the Centrifugal Compressor, *Chem. Eng.* Oct. 1947 to Feb. 1948, specifically, Jan. 1948, pp. 118-121.) In short, any process calculation that follows the laws of perfect gases can be solved directly with these charts.

For example, assume that we are compressing air with a compression ratio of 2.0, at the rate of 15,000 cfm. at inlet temperature of 60 deg. F. (520 deg. R.) and 14.7 psia. inlet pressure. The k value of air is 1.395. Determine the following:

1. What will be the discharge volume and temperature if the process is adiabatic?
2. What will be the discharge volume and temperature if the polytropic efficiency is 75 percent?
3. What is the adiabatic efficiency for Question 2?
4. Assuming that the measured discharge temperature is 230 deg. F., what is the discharge volume, n value, polytropic efficiency and adiabatic efficiency?

Solution, Question 1—Using Fig. 1, at $n = k$, $V_2/V_1 = 0.610$. Then, discharge volume = $0.610 \times 15{,}000 = 9{,}150$ cfm. From Fig. 3, at $n = k$, $T_2/T_1 = 1.219$ and $T_2 = 1.219 \times 520 = 633$ deg. R. = 173 deg. F.

Solution, Question 2—The relation between the polytropic exponent n and the adiabatic exponent k is:

$$\frac{n-1}{n} = \frac{k-1}{k} \times \frac{1}{e_p}$$

where e_p is the polytropic efficiency. Substituting the given values in this expression we have $(n-1)/n = (1.395-1)/1.395 \times 1/0.75$. Solving for n we have $n = 1.609$. Then from Fig. 1, at $n = 1.609$, $V_2/V_1 = 0.65$ and $V_2 = 0.65 \times 15{,}000 = 9{,}750$ cfm. From Fig. 3, at $n = 1.609$, $T_2/T_1 = 1.3$ and $T_2 = 1.3 \times 520 = 676$ deg. R. = 216 deg. F. Checking from Fig. 2 for $n = 1.609$ and $V_2/V_1 = 0.65$, we again find $T_2/T_1 = 1.3$.

Solution, Question 3—Since adiabatic efficiency is (theoretical adiabatic temperature rise)/(actual temperature rise), then

$$e_a = \left(\frac{T_2}{T_1} - 1\right)_a \Big/ \left(\frac{T_2}{T_1} - 1\right)_a = \frac{1.219 - 1}{1.3 - 1}$$

or

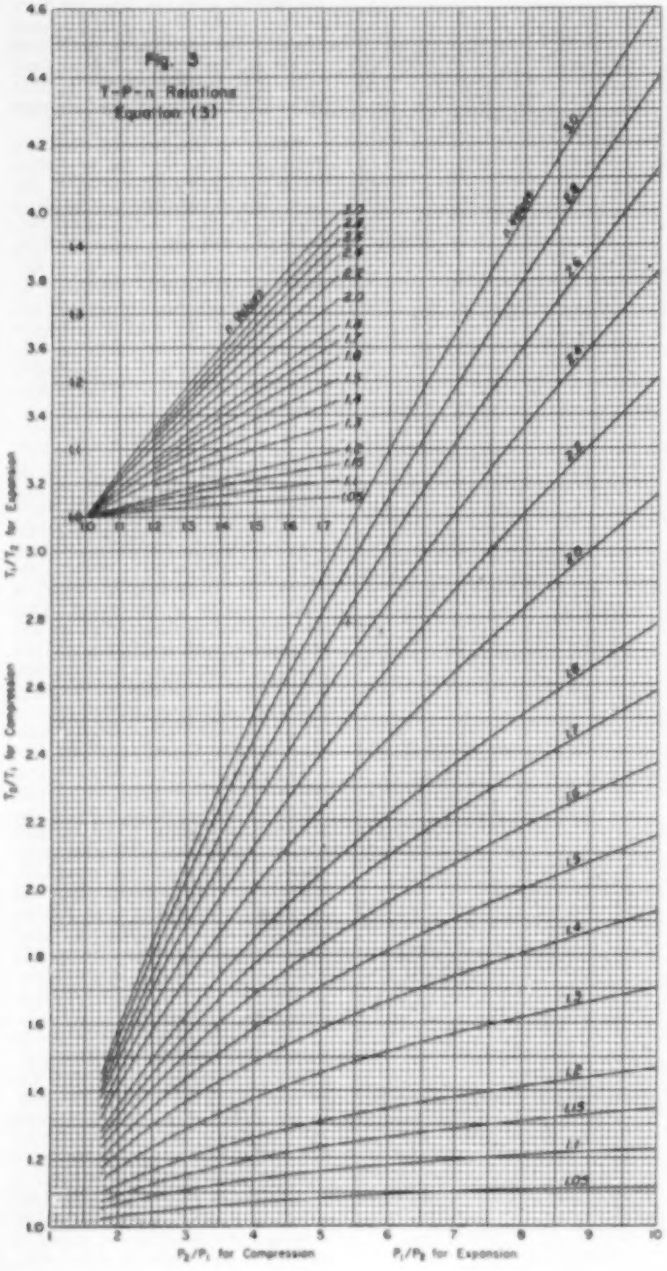
e_a = 0.73 or 73 percent.

Solution, Question 4—Actual $T_2/T_1 = (460 + 230)/520 = 1.328$. From Fig. 3, with $T_2/T_1 = 1.328$ and $P_2/P_1 = 2.0$, $n = 1.7$. From Fig. 1, with $P_2/P_1 = 2.0$ and $n = 1.7$, $V_2/V_1 = 0.665$ and $V_2 = 0.665 \times 15{,}000 = 9{,}975$ cfm. From the relation above between n and k, substituting, we get $(1.7-1)/1.7 = (1.395-1)/1.395 \times 1/e_p$ and $e_p = 0.687$, or 68.7 percent. Then, for adiabatic efficiency,

$$e_a = \left(\frac{T_2}{T_1} - 1\right)_a \Big/ \left(\frac{T_2}{T_1} - 1\right)_a = \frac{1.219 - 1}{1.328 - 1}$$

or

e_a = 0.668 or 66.8 percent.



Memo from the Editors

Please check to show your degree of interest in each of these articles or departments that appeared in the March issue of Chemical Engineering.

Page		Greatly Interested	Moderately Interested	Did Not Read
89	Chementator	☐	☐	☐
91	Memo From the Editors	☐	☐	☐
93	Cold War on Cold Rubber? (Editorial)	☐	☐	☐
94	Wax and Lube Oils at Cit Con	☐	☐	☐
96	Fastest Way to Move It	☐	☐	☐

The Time Will Come . . .

. . . . when each of you 35,000 subscribers* to *Chemical Engineering* will get a check list that will look something like the above cut. It will ask you to indicate your interest in each article and department in some particular issue.

We're doing this because we want to be sure we give you the stuff you need the way you want it. Our check list system is one of several ways we're using to find out. It is "something like an election in a democracy," as somebody put it recently—your chance to vote for the kind of *Chemical Engineering* you want. In a year or so from now, after we've polled the 35,000 of you, we'll start all over again.

Many of you have already asked, "What do you do with the results?" Well, every month we count and plot the check marks (usually about 6,500 them). That gives us a good idea of how much you like each article in each issue. After six months or so, one of us spends a lone weekend doing the same thing for the monthly results. That gives us a good idea of the type of articles you like. Then we make special efforts to get more of the kind of material that you—collectively—have "voted in."

We simply can't acknowledge all your letters and suggestions. But we do appreciate your cooperation in helping us give better service to engineers throughout the chemical process industries.

* Official figure is 35,107—the largest paid net circulation of any monthly chemical publication in America (in the world, for all we know).

Capsulated Contents

You may be wondering why we started that radical fractional-page section at the front of our magazine. Some of you had pointed out that it wasn't always easy to find items in *Chemical Engineering*. Others (knowing that new developments are often first announced in ads) have been asking for an index of advertised products. Returns from our readership studies (see "The Time Will Come" on this page) showed that you wanted something that would make it easy to get more details on new products and equipment.

Your comments set us thinking. We dreamed up a dozen schemes, then talked down all except this one. To our way of thinking, it stands up well under the acid-test questions: Does it make it easy for the reader to find — and find quickly—what products, equipment and materials are mentioned in the text and ads of each issue? Does it make it easy for him to get—and get promptly—more information on those items that might help him in his job? Said Publisher Traendly: "Let's get going and give it a try and see how the readers like it. What if it is radical?"

Bits and Pieces

• "Some books . . . . are to be digested," said Francis Bacon. But he didn't tell how to spot the digestible ones. So to make it easier for you to pick them out of the 100 or more books we review each year, we select every month a book-of-the-month for chemical engineers. Les Pope tells about the book and why it is important, digs up dope on the author and why he wrote it. (See Chemical Engineer's Bookshelf, p. 300.) We hear that another chemical publication is now playing with the same idea.

• Added to our staff on March 1: Dick Demmerle, for over four years associate editor in New York of *Industrial & Engineering Chemistry* and *Chemical & Engineering News* (see p. 253, this issue).

• Phil Swain, editor of *Power*, is a guy whose cup of ideas, imagination and enthusiasm runneth over. Here is one of his proverbs for young engineers: "To insure success pick the right boss and proceed to make his life easy."

• It's proverbial (or should be) that an editor's work is never done. It looked that way to us last month when we were averaging close to 17 hours a day, seven days a week.

• Speaking of printers' errors, Callaham's name is without doubt our most expensive single word. Even after nine years, the printer can't quite believe that there is such a name; every month, in a half dozen obscure places, he spells it with an *n*. Then we have to pay—and plenty—to correct it back to *m*. Once asked how in the heck O'Callaghan ever became Callaham, John replied: "Five generations of honest Irish illiteracy," and seemed proud of it!

• Did you read our recent articles on robotization? Within a few weeks, Author Brothman got letters from a round dozen of the top chemical companies in this country. One of the biggest has asked him to lecture to 25 of its key men from coast to coast. Robotization, we believe, will become a major trend in our industries.

How to Make the Most of Your First Job—Or Any Job

A follow-up of Do's and Don'ts by the author of last month's article "How to Get a Job, the Right Job"—with comments by an experienced chemical engineer. These practical tips will help make your first job the right step toward success.

BARRY MOYERMAN
with comments by
ZOLA G. DEUTSCH

Entering your first job is quite like your first freshman days at college or your induction into the armed forces. You will feel strange, yet you can adjust yourself quickly to the day-to-day employment routines. Learning the plant layout, the names of co-workers and your duties and responsibilties is not the most difficult adjustment you will have to make.

> (DEUTSCH: *"It is a good stunt to make, and keep up to date a private 'organization chart' of the outfit you are working for. In this way names, lines of authority, and scope of duties of all your co-workers can be delineated. You will learn much about staff-and-line organizational procedures, the exceptions to these that are common in industry, and how successful administrators practice the delegation of authority."*)

The most basic thing is to take the proper attitude toward your fellow workers. Most important, avoid any air of superiority toward those that are not college graduates or engineers.

STOP: ALWAYS LISTEN

Chemical engineering is still young as a formal profession and some of your rugged rule-of-thumb associates may really be the "first engineers." These men have much to offer. Listen to their advice and integrate their knowledge and techniques with your own technical background. This will help you bridge the gap between theory and a practical solution when you are faced with a tough problem. Not only can they make useful suggestions, but they can give you the cooperation and acceptance needed to make any newly designed process work smoothly.

As a "green" engineer, you can learn plenty about processes and operations from the plant artisans, laborers and mechanics. A process man who has been on a job for many years can be a source of excellent ideas; he can give forthright practical advice when you ask about proposed changes. Careful observation of mechanics and artisans as they install, repair and maintain equipment may help you make more practical equipment designs and layouts.

> (DEUTSCH: *"Remember that an expert and highly paid baseball fielder knows practically nothing about the laws of air friction or the equations of trajectories —but he sure knows how to get "under the ball."*)

The ability to keep quiet and listen until you are dead sure you know what you're talking about is priceless. The exercise of restraint—stifling the impulse to pretend to be a great authority—is just good common sense.

> (DEUTSCH: *"Many an ordinary, or even mediocre, individual gets and holds a reputation for being a deep thinker merely by keeping his mouth shut. Even the most capable engineers who do too much talking are in constant danger of being considered to be expert 'bull slingers.' It is generally unbecoming in a young man to do too much talking, or even a moderate amount of over-confident talking."*)

Gossiping on the job is deadly. Listen with respect and interest to advice but follow only what is logical and what you understand. Don't worry too much about who gets the credit for a job well done, but complete your assignments to the best of your ability.

Be meticulous, follow through on details, try to plan each job fully and completely so that there will be no last minute delays because of some detail that wasn't provided for. Above all, learn what has been done in the past but do not let tradition limit your search for a solution to a problem. Your final solution will often be to do what everyone else has done in the past. But your own study, research and analysis may give you a new and better answer.

HOME: DO SOME WORK THERE

Don't be a clock watcher. Do some homework from time to time—especially when the problem requires a lot of cool balancing of pros and cons.

> (DEUTSCH: *"Remember that most theoretical solutions 'ignore second and third order differentials'; even empirical adjustments for these, on the basis of the practical man's experience, may make the difference between a reasonably good solution and the really best solution to a problem."*)

Your most valuable engineering asset is a knowledge of current technology. Yet you will soon find yourself far behind the fast-moving frontiers of science unless you add daily to the fundamentals you got in school. "The man who graduates today and stops learning tomorrow is uneducated the day after tomorrow."

Keeping up with recent engineering developments will require continuous study. Though important, it is not enough just to read the trade journals of a specific industry. The publications of the various technical societies should be on your reading list. You should constantly add new textbooks to your personal engineering library. What's more, you must find time to read them. Equipment manufacturers' catalogs can give you a wealth of information on new machines, process equipment and instruments. The time you spend in adding to and studying a catalog file will pay long-term dividends.

Most cities have local chapters of the American Society of Mechanical Engineers, American Institute of Chemical

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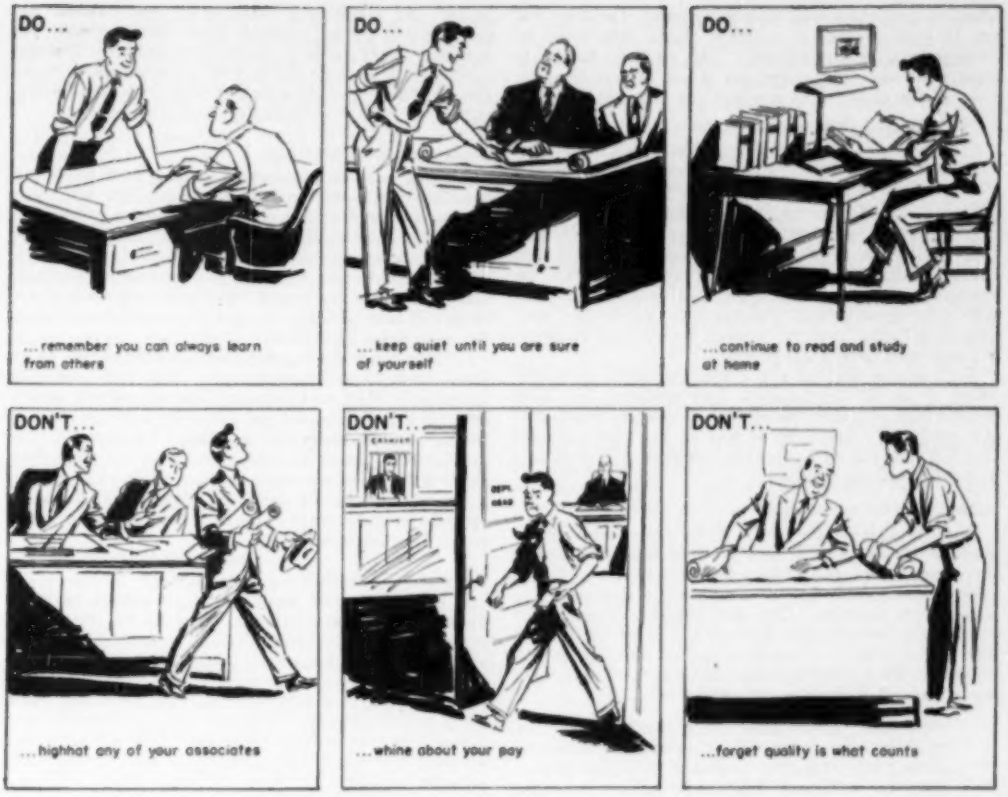
Last month we told you who AUTHOR MOYERMAN *was and a bit about his experiences (March, p. 98).* ZOLA DEUTSCH, *who makes the comments in this article, is a well-known chemical engineer with Deutsch and Loonam, consulting engineers and metallurgists in New York.*



Engineers, American Chemical Society, American Institute of Electrical Engineers and other organizations of this type. Meetings are usually addressed by prominent speakers, each an authority in his own field. It is a professional "must" for you to join the particular society most closely affiliated with your specific interest and to develop the habit of attending its meetings. Knowing the people who are creating new frontiers of engineering is as important as keeping up with principles and practices.

GRADUATE COURSES: A QUESTION

Another way to add to your engineering knowledge is to take graduate courses. In some companies an advanced degree is a prerequisite for advancement to certain positions. Others think highly of advanced studies in general and make a sincere attempt to encourage their employees to take them. However, some companies feel that a specific knowledge of processes and experience within the organization should be the only educational requirements for promotion. You must make your own decision: whether the prestige of an advanced degree outweighs other considerations or whether you can use the same time to better advantage becoming familiar with the problems of your own industry through self-education. The problem requires thought and evaluation. Better wait a year or more before making a decision, particularly when you are in some doubt about what courses will help you most.

(DEUTSCH: *"A good general rule is to study those subjects in which your interest is natural and self-generating. Also, it is always good to be considering and actually working on the writing of a technical paper. Even if your company does not allow or is reluctant about publication, it is a good idea to write papers—even if you file them away in a drawer at home."*)

Pay as much attention to your social growth within your plant or organization as to your educational development. More and more you will find yourself dealing with people. Successful "human engineering" must be based on a genuine interest in other people, their personality, problems, character and ambitions. Make these contacts on a continuing basis over a long period of time. Asking a pipefitter about his family once and then not even nodding the next time you meet him is worse than having said nothing. You don't need a conscious motive for these contacts; discovering interesting qualities in people all around you is reward enough.

When all relations are put on a personal basis, your day-to-day job problems somehow seem to get solved with less friction and with a real spirit of comradeship and cooperation.

LEARN FROM SALES ENGINEERS

Take the same attitude toward people outside the plant or office. Get to know the fellow members of your technical societies. Encourage them to tell you about their work, their goals, their opinions on engineering and social problems.

Get to know the sales engineers who come into your

office, their products and their background. Let them tell you of their experiences in other plants, their views of developments in the industry. Their opinions can be of great value since their viewpoint is not limited to operations in one plant. They can give you objective advice.

(DEUTSCH: *"It is also wise to let salesmen talk to you about their methods of selling. You should try to urge them to discuss these matters because you are always a salesman, at least selling yourself."*)

Often a specific problem in your plant which the most experienced company man cannot cope with can be handled by someone with a broad perspective who has seen similar situations in other plants or other industries. Be interested in these other folks and their problems and they will be interested in you. The day of the inarticulate, nongregarious "cold" engineer is over. To be a real engineer, it's important to be a real person!

Let's assume that for a year you have made an honest effort to do all the things I have outlined—you have worked hard, adjusted yourself to your new life in industry, get along with a minimum of friction, like your associates and feel they like you. Now your question is: "How do I know I'm making progress?"

RAISES: SIGN OF PROGRESS

Signs of progress are usually dollar signs. Salary is one measure of achievement and accomplishment in almost any organization. Just when a first raise should come and what the increment should be are matters that vary from company to company. One chief engineer is proud that "No one in this company has ever had to ask for a raise." On the other hand, it has been said of some companies: "Fight for the highest entering salary you can get, for once on the payroll it's hard to get a raise."

(DEUTSCH: *"Don't make a pest of yourself by whining about raises or comparing your own output and salary with that of another co-worker. At the same time, don't be a Caspar Milquetoast about requesting raises."*)

Make certain to avoid certain pitfalls. The average young engineer gets impatient about raises. He usually feels he deserves one long before his achievements really warrant it. The dean of one engineering school has told me of several cases where men left a job because no raise was in sight. But the dean found that in every case these men were slated for promotion within a short time. Generally speaking, if no raise is forthcoming go in and ask for one—but be prepared to answer fully and honestly the boss if he asks, "Why?"

(DEUTSCH: *"It is a good general rule never to quit a job for another at less pay—or even the same pay."*)

Engineers seldom become really wealthy men. If money is all-important to you, pick another field that is more rewarding. However, most engineers (like other professional men) do find that their work as the builders and imaginative creators of the nation's industry gives them satisfying non-economic rewards.

We have all heard stories of men who have risen within one company from office boy to president by virtue of ability and length of service. There are such men in America today. However, their number is small and it seems to be becoming smaller. Too often, it seems, top executives are brought into a firm from another organization. Too often companies look outside their own ranks when openings occur higher up the ladder.

It would be nice if you—having carefully picked your first job—could rest assured that by virtue of hard work, loyalty and ability you could reach any position you desire within the organization, be it chief engineer, vice president in charge of production or president. Unfortunately, many of us do not find these opportunities in our first jobs. Too often we must find such promotional potentialities by a rather cut-and-try method of job selection.

BEGINNER? DON'T STAY ONE

Although no one recommends skipping from job to job, there are often good reasons for changes. The first group of reasons may be classed as those beyond our control. In this category are layoffs due to a dip in business, a merger of the company with another organization or a bankruptcy. Large companies whose over-all profit picture may be good and whose name is a household synonym for financial stability still have periodic ups and downs which are felt in the engineering department.

At these times, the beginner who has not had time to get a real foothold is the person most likely to be cut from the payroll. Such an unpleasant (yet impersonal) experience has this plain moral: get out of the beginner status as fast as possible. Stop letting yourself be classed as the "junior man" when the layoffs do come. This rise from junior status is not entirely a function of length of service; it can be reached more rapidly by the man who has a real aptitude for and interest in his work than by a man who is merely "putting in time."

FIRED? THAT'S SERIOUS

A second group of reasons for a job change are more serious for the person involved. These are the reasons that are within control. The first of these controllable reasons is what's commonly known as "getting fired."

Getting fired is a serious thing. It is a strong indication that something is definitely wrong, that a problem exists which you should face. Of course, you can rationalize and answer that "the world's against me." This will salve your wounds. But this is not a technique used by any well-adjusted person.

(DEUTSCH: *"It is wise to remember that the most stable type of advancement is due more to being pushed up by the men below you than being pulled up by your boss. Every time anyone is advanced there are some who think that he is the boss' pet."*)

There are usually two big reasons why an engineer is fired: (1) he can't get along with his co-workers or (2) he doesn't have technical ability. This second reason is really not often used. Job selection methods enable employers to select men who have adequate technical training (although there may be misfits in cases where the ability to do individual thinking is the important job element).

If you should ever be fired for lack of technical ability, you can do two things about it: (1) learn to gage your abilities better so you won't again find yourself in a position beyond your technical or creative depth; (2) make up your mind to keep growing educationally at an accelerated pace until you can hold your own on any technical job.

MOST PEOPLE ARE FIRED BECAUSE . . . .

The first reason for being fired—inability to get along with your co-workers—is by far the most important among technical men today. Will Rogers once said, "I never met a man I didn't like." This simple statement has much food for thought in it. In essence it says that the attitude of people toward you is a function of your attitude toward them. The topic cannot be discussed at length here but it is a most important one. Remember this: your personality inadequacies can be a much greater handicap than your technical inadequacies.

(DEUTSCH: *"Many a job applicant says that the reason he changed jobs was that he was 'unlucky to be working for a so-and-so, or to have such a group of so-and-so's in his department.' Most personnel directors consider themselves in too vulnerable a position to take a chance at such 'unlucky' people."*)

The second "controllable" reason for changing jobs is voluntary leaving. A common cause for leaving a job, particularly for beginners, is the lack of opportunities for getting ahead. This can be imagined or it can be real. Young engineers should realize that youth and impatience are synonymous, that opportunities for advancement will usually come along naturally if a little more self-control is exercised.

On the other hand, the vice president of one large company who makes a habit of following the careers of young engineers and looking ahead to see where they can be moved up the line admits that these "blind walls" are sometimes real. Often he finds that some important job is being held by a man who will not have to be replaced for many years. He then calls in the young engineer who would eventually be suited for that higher job and points out to him the promotional impasse which he faces with the company. Often the company even helps the man get another position with a firm that offers greater opportunities.

BEFORE YOU QUIT: READ THIS

But whether your lack of opportunity for getting ahead is real or imagined, have a long talk with the head of your department before making any move. Most people don't have this kind of frank talks often enough. Yet they can help eliminate many of your problems which do not seem to have a solution.

(DEUTSCH: *"Remember that most bosses hope to be able to keep you satisfied by holding out promotions and raises at just the right distance to keep you pulling your hardest. By pulling just a little harder, you can either catch the raise or the promotion or else force the boss to hold out an even more attractive plum for you."*)

There is still another reason why many engineers change their jobs: they get a better offer from another company. Key men often get these offers from firms that are expanding or building new facilities. Before taking up an offer like this, find out about the reputation of the company making it—especially its personnel policies. Also it is important to estimate the chances of that company's success. Is it locating in an area that needs the new facilities? Is it in a field that is declining or expanding? Your answers to these and other questions should be balanced and evaluated before you make your decision.

Job changes are also made by engineers who want a change in the type of work they are doing. Experienced design engineers often go out on their own as consultants. Young production engineers become interested in sales engineering. If you can't make changes like these within your company then, of course, you must look elsewhere.

Getting your second engineering job should be easier than landing your first one. The "green" man with no industrial work history and no proven performance record will always be to some extent an unknown factor. Yet in your search for a second job, all that was said about finding your first engineering job still applies (see *Chem. Eng.*, pp. 98-101, March 1950).

Yet there are other differences. Don't leave your first job until you have your second one definitely lined up. A continuous work record, with minimum periods of unemployment, is an asset on any resume. It is therefore wise to hold on to that first job until the last possible moment. This may make your job interviews and appointments a little difficult, but with careful planning it can be done.

Don't leave your first job (in the case of a voluntary change) without giving ample notice. A tactless closing of a chapter in your working life can destroy a great many good things you may have done.

There is another important difference between looking for your first and second jobs. Friends you have made on your first one can aid you in getting your second one. Engineers in other companies, sales engineers, personnel men and others can sometimes do wonders in helping you find that right spot. Most of us know of many instances where jobs were gotten in this way.

The decision to change jobs is a difficult one to make. It involves leaving the known for the unknown, the familiar for the unfamiliar. It is especially true where the known and familiar, though not liable to lead to any real opportunities, are pleasant and comfortable. Sometimes your security will have to be sacrificed. At other times, you will have to change your geographical location. Your evaluation and analysis in such a situation can go only so far. From then on there is an element of risk, of gamble. But often you can succeed only by gambling with a calculated risk. At such an early stage in your career stability, security and lack of risk should be worth very little. Don't vacillate, don't sacrifice opportunity for the "flesh-pots of Egypt."

GETTING AHEAD: A FORMULA

Many different subjects have been touched on in this article. They all have one thing in common. They are related to the subject of getting ahead—a term that in itself is rather meaningless.

(DEUTSCH: *"The surest and simplest rule for getting ahead is: always please your boss! Your problem, then, not only on your first job, but on all jobs, is to figure out how to please your boss. Don't do this by trial and error. Be reasonably sure what will please him before going out on a limb. Remember also that very, very few bosses are pleased by do-nothings. Most bosses like you to make your suggestions a little at a time so that they can be considering the thing and ripening their own opinion of its merit. Very few bosses like to be handed a fully worked out proposition and have you insist on an immediate decision in the matter. Find a way to work up to it gradually and a way to offer it without offending anyone in the organization. Most people naturally resent new ideas because they feel that they themselves should have thought of them. A good general rule is to indicate that the idea was suggested by so-and-so's mention of a need or a difficulty."*)

Each of us in industry has a need for a basic philosophy. Industry in America is not paternalistic. It does not, of necessity, owe even the best trained and qualified engineer a respectable living. The background of our country, its history and mores make such an idea foreign to our way of life. And so each of us must plan, set up goals and try to reach them with a minimum of outside and government aid.

A MAN'S FORTUNE . . . .

I am not advocating the rough-and-tough gangster philosophy of the 20's—"Watch out for A-Number-One." I advocate what Bacon had in mind when he wrote ". . . but chiefly, the mould of a man's fortune is in his own hands." Handle your fortune with care.

Effective Radius of Agitation in Viscous Liquid Mixing

Agitation of viscous liquids is influenced considerably by the "effective radius of agitation" which depends on viscosity, power input and system characteristics.

H. E. SERNER

One of the simplest methods for agitating liquids or liquid mixtures when they are confined in a vessel is to use a high-speed impeller such as a turbine or a propeller. When the liquid to be agitated is one of low viscosity, such as water, the motion or disturbance created by the impeller will be propagated throughout the confines of the vessel, even if the vessel is very large and even if but little power is used for agitation. This condition changes noticeably, however, when liquids of higher viscosities are agitated. With viscosities of sufficient magnitude, the motion imparted by the impeller may cease altogether at a short radial distance from the impeller, so that the agitation will be limited to a smaller liquid volume than the vessel capacity.

This condition is frequently encountered when the height or length of the vessel is considerably greater than its diameter. It has been customary in such cases to use two or more impellers, so that their combined spheres of agitation cause the entire contents of the vessel to be agitated. Sometimes with liquids of extremely high viscosity, satisfactory results can be produced by increasing the speed of the impeller, but this expedient often increases the power consumption beyond an economic level. With extremely high viscosities it is often necessary to make use of slow moving, and therefore costlier, mechanical agitators of the paddle, anchor, and similar types. Such devices can accomplish the agitation of highly viscous liquids without resort to high velocities because their arms, paddles, or blades ordinarily extend almost through the diameter of the vessel.

H. E. SERNER, *the H. E. Serner Co., New York 17, is the author of several earlier articles in* Chemical Engineering. *He specializes in mixing problems and their equipment.*

To understand the conditions that limit the propagation of agitation or motion in Newtonian liquids of various viscosities, it is necessary to consider the fundamentals involved. Viscosity, expressed in poises, also indicates the "fluidity" of the liquid under consideration. The higher the viscosity, the less is the fluidity of the liquid, and the more limited will be the distance from the focal point of agitation to the border area where the motion of the liquid ceases. The rational determination of this distance is a valuable aid in the design of agitating and mixing devices for operation in highly viscous materials. This critical distance may be described as the "effective radius of agitation."

In approaching the solution of this problem on a rational basis, it is helpful to assume the existence of theoretically ideal means, and of ideal operating conditions, such as an ideal impeller operating in an infinite volume of liquid. An ideal impeller would be able to impart uniform motion to the surrounding liquid in every radial and angular direction from the focal point of its action, so that the motion so created would spread through the surrounding liquid in the shape of a sphere of ever increasing diameter. Such an impeller would transmit motion to the liquid without loss of energy, so that all of the power expended would be converted into motion of the surrounding liquid.

Circulation, set into operation from a focal point in a body of liquid, will propagate spherically until the total power available equals the frictional resistance between the outer surface of the sphere of moving liquid and the surrounding motionless liquid layer. At this extreme distance from the focal point the liquid velocity is so low that it will be in the range of viscous flow.

If we are to determine the radial distance from the focal point of agitation to a point on the surface of the sphere of circulation, at which circulation just ceases, it is necessary to know: (1) The total power input at the focal point; (2) the retarding force per unit surface, represented by the viscosity; and (3) the total surface area of the sphere of liquid which has a surface friction against a stationary liquid layer just equal to the total power input.

For practical design of useful equipment the exact determination of this theoretical and extreme distance is of no great value. However, the problem can be solved quite simply for ordinary design purposes when a definite but low terminal velocity is assumed.

The shear force due to viscosity, as measured in poises in the c.g.s. system, is $F = \mu VA/L$, whence $\mu = FL/VA$, where F = the force in dynes, μ = viscosity in poises, V = the relative velocity in cm. per sec. of two parallel planes, each of A sq.cm. area, and L = the distance between the two planes in cm.

Dimensionally, the second equation is μ = mass/(length) (time). Taking a low terminal velocity of 1 cm. per sec. and converting to the English system, 1 poise equals 0.0672 lb./(sec.) (ft.) and 1 centipoise equals 0.000672 lb./(sec.) (ft.). Since the radius of a sphere equals $\frac{1}{2}\sqrt{A/\pi}$, then the effective radius of agitation in feet equals

$$R_e = \frac{1}{2}\sqrt{\frac{\text{Total power input, ft.-lb./sec.}}{\text{Centipoises} \times 0.00211}}$$

The result of this equation is shown graphically in Fig. 1.

As motion spreads from the focal point of agitation, the first assumed spherical layer of liquid is set in uniform motion, and this in turn sets the next adjacent layer in motion through friction. Eventually the total friction created by the last spherical layer moving in contact with the surrounding stationary layer will equal the total

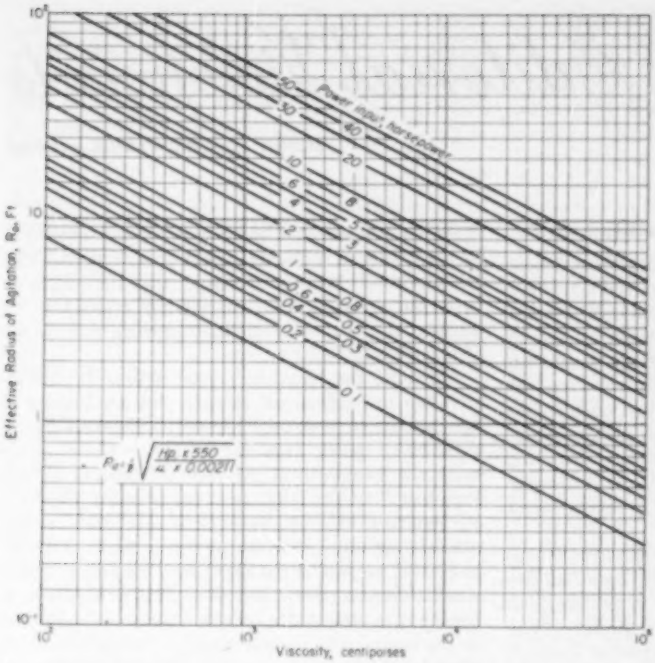


Fig. 1—The theoretical effective radius of agitation depends only on liquid viscosity and power input; a factor of safety must be applied in practical cases.

power input. During the initial period, when the motion of the liquid in the successive layers is being accelerated, considerable power is being absorbed by the internal friction of the liquid mass, but after the equilibrium condition of total circulation has been attained, this internal loss of power becomes very small, provided the circulation of the liquid is of a simple, more or less concentric type, in a cylindrical tank with an impeller operating near the center of the liquid volume.

However, when the vessel is provided with internal baffles or other means of creating a turbulent or irregular type of fluid circulation, then power loss due to internal friction may reach and even exceed 50 percent of the total power input. The amount depends, of course, on the degree of turbulence created in the liquid body. Small, high-speed impellers are seldom used to create such irregular and turbulent flow conditions in liquids of high viscosity, because the necessary power requirements would become excessive. In such cases it is advisable to choose a type of high-speed impeller able to accomplish a maximum mixing effect by its direct action, and without baffling.

In using this theoretical concept of effective radius of agitation for practical design, a safety factor must be applied to take into account the performance characteristics of various impeller types. It is also necessary to consider the common irregularities of tank surface and shape. The patterns of total circulation effected by propellers, turbines and disk impellers are of more or less ellipsoidal shape as suggested in Fig. 2. In the case of

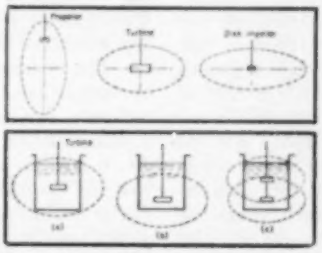


Fig. 2—Approximate patterns of total circulation produced by propellers, turbines and disk impellers.

Fig. 3—Effect of turbine impeller location and number on circulation pattern in agitated vessels.

the propeller the actual effective radius of agitation parallel to the shaft and in the direction of the fluid discharge may be assumed at 50 percent of the theoretical radius given by Fig. 1, and about 15 percent of theory in a direction at right angles to the axis of propeller rotation. In the case of the conventional turbine, the effective radius may be assumed as 30 percent of theory in a direction at right angles to the axis of rotation, and 20 percent in a direction parallel to this axis. In the case of the multiple disk impeller, the effective radius may be assumed at 40 percent of theory in a direction at right angles to the axis of rotation of the impeller, and 15 percent in a direction parallel to this axis. Since the determination of the effective radius of agitation is based on a terminal liquid velocity of 1 cm. per sec., suitable allowance must be made when higher peripheral velocities are to be obtained.

The problem of producing complete agitation of highly viscous liquid bodies with propellers or conventional turbines, without excessive power consumption, comes from the fact that the discharge areas of these devices are relatively large with respect to their diameters. When the speed of rotation is increased, the volume of the liquid pumped increases in proportion to the increase of the discharge velocity. The power consumption rises in proportion to the discharge volume, and in addition rises as the third power of the discharge velocity. Multiple disk agitators offer an advantage in this type of service since they permit high discharge velocity without high pumping capacity. For a given power input this enables the greatest effective radius of agitation to be obtained.

When a body of liquid is to be agitated in a vertical cylindrical vessel, as shown in Fig. 3a, a suitable impeller located near the center of the liquid body may be used. The approximate effective radius of agitation for a turbine is indicated by the dotted line. But if, for any reason, it is necessary to place this impeller near the bottom of the tank, the effective radius becomes insufficient to agitate the entire body of fluid, as indicated in Fig. 3b. In such a case two or more impellers may be used. The combination has a total power consumption only slightly in excess of that of the single impeller in Fig. 3a. In spite of their shorter effective radius, their combined spheres of agitation will bring about complete agitation of the entire tank contents, as shown in Fig. 3c.

Editorial Viewpoints

SIDNEY D. KIRKPATRICK and Staff

Needed: Scientific Statesmanship

After five years of political negotiation and debate both houses of Congress have passed and President Truman is expected to sign the National Science Foundation Act of 1950. For many reasons it should not suffer the fate of its 1947 predecessor, which was allowed to die a painless pocket-veto death by President Truman because in his opinion it put too much policy-making and money-spending power in private hands. The present measure directs the President, with the consent of the Senate, to appoint a $15,000-a-year administrator and 24 members of the governing board of the foundation.

The original purpose and spirit behind the formation of a National Science Foundation have had few opponents. The eight-point program to promote and coordinate basic research and foster the graduate training of the men who do it has met with general approval. As with any government sally into a field previously occupied by private effort, however, there is present the spectre of possible bureaucracy and its two cohorts, waste and extravagance. Fortunately, scientific accomplishment can be measured by tangible data, if not by tangible results, and it should be possible for keen, impartial observers to judge within a few years whether the foundation is really worthwhile or just another assault on the taxpayer's wallet.

Of more immediate concern is the fact that two possibly noble but surely naive security amendments have been jammed into the foundation bill as it passed the House. They were proposed by Representatives Smith (D.Va.) and Flood (D.Pa.) and make it mandatory for the Federal Bureau of Investigation to cull the pasts of all recipients of foundation scholarships and all employees of the foundation for previous subversive affiliations. The scientists are already beginning to object to these provisions and the whole issue of academic freedom that rocked many campuses a few decades ago has now entered the Capitol grounds.

It is probably still too early in the interminglings of scientists and legislators to think this difficulty unexpected. The two groups only began recognizing each other as distinct functionaries in the war that ended with an atomic blast and it may take a few years yet for them to develop a common denominator of understanding as men who jointly shape the destiny of a nation. For the sake of that nation it seems that in this instance the President and the congressmen should absorb the lesson that so many college presidents had to learn—the best way to judge a scientist is by the esteem in which he is held by his fellows. May we respectfully suggest, therefore, that the advice of both the scientific and engineering professions be sought and studied when appointments are made to the 24-man directorate?

Because the foundation must devote its primary attention to fundamental research and scholarships in the basic sciences, at least half of its members should logically be drawn from the sciences. However, we must not lose sight of the fact, as reported by the President's Scientific Research Board under Dr. John R. Steelman, that engineers hold first place among research personnel, accounting for a total of 42,000 or over 30 percent of the aggregate. Therefore, a substantial portion of the board—at least 6 members in our opinion—should be selected from men eminent in the major fields of engineering. An equal number should be drawn from among public-spirited citizens outside of the narrower circles marked by scientific and professional eminence. With such a balancing of the basic sciences and their engineering applications, strongly supported by leaders in the field of public affairs, the National Science Foundation could usher in a new order of scientific statesmanship in the administration of this vitally important legislation.

A Plea for Sanity

There is occasion for concern as to the over-zealous interpretation which certain public officers now appear to be giving to the question of air pollution. There may be occasional need for these worrisome ideas. But there is no justification for some of the generalizations and accusations which are leaking out of Washington.

The extreme conclusion seems to be developing in certain quarters that chronic exposure to even extremely small quantities of air pollution represents a serious but rather general public hazard. Donora, Pa., is cited as one horrible example. The theory is that very low concentration of objectionable material in the air results in a general impairment of public health. In one case the extreme claim was made that the public suffered more from these continuous exposures than would the workmen in a plant from which they emanate.

There is no excuse for continuing air pollution where really significant quantitities of objectionable material are discharged into populated areas. Such

cases must be investigated and the air pollution prevented. That is a clear responsibility of industry which it will accept. But some of the zealous officials, who talk loosely about chronic danger to the public, must also accept their responsibility to get facts before they make charges which are needlessly disquieting to the public.

Senior executives of federal and state agencies should see to it that their talkative subordinates do not speak of these matters without first getting the facts and appraising them accurately. This precaution should be taken by all of the government departments which may become interested.

USTCAP, No. 1

This need for sound deliberation in dealing with problems of atmospheric contamination is especially timely in view of the first United States Technical Conference on Air Pollution to be held in Washington May 3, 4 and 5. Under presidential instructions, the Secretary of the Interior has asked the Federal Interdepartmental Committee to sponsor panel discussions on the following subjects: meteorology, health, instrumentation, analytical methods and properties, equipment, agriculture and legislation.

Able chairmen and co-chairmen have been appointed for each of the seven panels. Papers from interested authorities have been invited and it is expected that the ultimate report on the findings of the conference will add materially to our knowledge of air pollution problems and their possible solution. Further details may be had from Dr. Louis C. McCabe of the Bureau of Mines, chairman of the Interdepartmental Committee.

Significantly, President Truman concludes his instructions to Secretary Chapman with this reminder: "I do not contemplate that the deliberations of the Interdepartmental Committee and the Conference will result in the creation of programs which will commit the Federal Government to material expenditures from an already heavily burdened treasury, since the responsibility for corrective action and the benefits are primarily local in character."

Bound and Rebound

An amazing effort was made at the beginning of March to secure for a term of ten years wholly unnecessary bureaucratic control of the rubber industry. Fortunately, seasoned members of Congress recognized the danger of the proposals and were prompt in overruling them. There was no excuse for the proposals made in the name of the President that the synthetic rubber industry should continue under detailed administration of Washington for ten years. Such action would have been against the public interest at this time and would have been contrary to sound policy for national defense.

But it is wise that members of Congress have planned to renew the authority of the President to continue operation of government plants for manufacture of synthetic rubber for an additional term of three years. Apparently the large rubber-goods companies were not quite ready to take over the manufacturing establishments which they have operated under leases. This fact seems inescapable when one reviews the widely varied proposals made vigorously on behalf of some of the leading firms in the industry. But there can be no doubt that all of the companies are ready to accept much more authority and devote appropriate responsibility to the tasks of developing new types of rubber and improving those now being made.

Charges by spokesmen of the Department of Commerce that the rubber industry did not want to buy the government plants were disproved as quickly as they were made. This, and further evidence, seems convincing that the Department of Commerce should be the last agency chosen to administer any part of the rubber business. Experienced congressmen certainly have made their sentiments very clear on this score. The rubber industry is to be congratulated that it will not be managed for the next ten years by those who have so sadly misunderstood its problems.

It is high time that a great deal of new authority be granted to the rubber manufacturers. They should be given an opportunity to prove that private research and its development on a factory scale will take place promptly if the government provides the opportunity for free action. Furthermore, the way in which synthetic rubber is to be used by industry should rapidly become a matter of business judgment by the executives of these companies. The public interest will not suffer.

If it should develop, which is highly unlikely, that the use of synthetic rubber under the conditions of free choice by companies is dangerously small, the President will still have ample power under the Act to improve the situation by adding any necessary amount as mandatory consumption. We do not think that the President will ever need to exercise that authority. But he should have it.

Synthetic rubber is no longer an infant. It is a growing youth of vigor and great promise. It will grow by freedom of action, the making of some mistakes, and the development of sound new policy appropriate for all circumstances. It is high time that the restraining hand of Washington be removed from its detailed operations. The public will gain as opportunity for competent industrial action is given and exercised. We believe that statesmanship in the industry will grow to match statesmanship in Congress if the bureaucracy of the executive departments is eliminated.

Willow Island Plant of Calco Chemical Division, American Cyanamid Co., Willow Island, W. Va. Ohio River supplies plant water.

Melamine—by Calco

Here's how melamine, of melamine-formaldehyde resin fame, is made at Calco's Willow Island plant. Calco is the only producer.

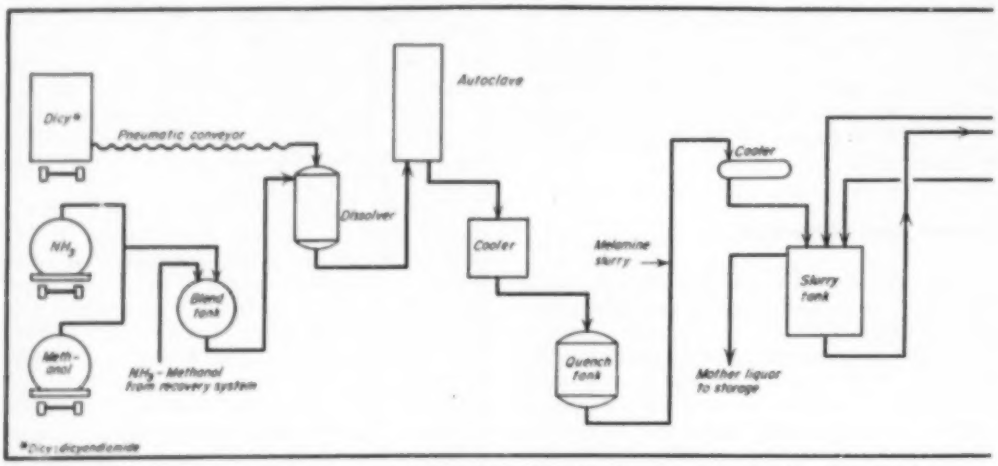
MORGAN M. HOOVER

Of the various processes for the manufacture of melamine, only two have been operated on a commercial scale in this country and in Europe. (Melamine is a trimer, for which dicyandiamide is the dimer, and cyanamide the monomer). One method involves the fusion of dicyandiamide (usually shortened to "dicy") with, for example, an acid salt of guanidine, and subsequent purification of the product. The other method, used with a number of variations, is based upon the polymerization of dicy under ammonia pressure, with liquid ammonia either alone or with another solvent to provide a reaction medium.

Melamine is produced by the Calco Chemical Division, American Cyanamide Co., at its Willow Island, W. Va., plant using a modification of the latter process, in which methanol is the secondary solvent. While several of the lower alcohols as well as other solvents have been used successfully, methanol was selected originally because of its low cost, complete miscibility with water and the ease with which it may be recovered in an anhydrous form satisfactory for reuse.

Calco began the manufacture of melamine at Bound Brook, N. J., with batch-wise operation of the autoclave process. When, after eight years operation, a further expansion and the erection of a new plant at Willow Island presented the opportunity, several major changes in equipment were made and the new plant was set up for continuous operation. While the autoclave reaction is still carried out batch-wise in order to insure close control of temperature and time cycles, the balance of the process is essentially continuous. Individual batches lose their identity through blending

MORGAN M. HOOVER, assistant editor, went to Willow Island last December to get the material for this article. This is his second on the Willow Island plant. The first, "How Calco Planned a Plant for Future Expansion," appeared in the February issue.



Diagrammatic flowsheet of the melamine process. Raw materials are dicyandiamide, ammonia, methanol, and caustic soda.

in slurry form during the washing and concentrating, and a uniform product of high quality is produced.

RAW MATERIAL HANDLING AND STORAGE

Dicy is received from North American Cyanamid, Ltd., Welland, Ont., in box cars. Cars are unloaded by means of a pneumatic conveyor either to storage or directly to collectors above the dissolvers. Facilities are provided also to move the dicy from storage by means of the pneumatic conveyor.

Methanol is transferred from tank cars to underground storage tanks by means of a Moyno pump. Liquid ammonia is transferred by compressor from tank cars to underground storage tanks. Caustic soda is received as 50 percent solution in tank cars and pumped to a central storage tank for redistribution.

The methanol-ammonia mixture for use in the autoclaving is made up by pumping a measured volume of each solvent to a buried working blend tank. Here the blend is mixed, sampled, analyzed and adjusted if necessary by the addition of one of the components before being pumped to a blend storage tank. Mixed solvents from the recovery system are also pumped to a working blend tank, where the composition may be adjusted before reuse. All transfer of mixed solvents is carried out by means of Moyno pumps.

AUTOCLAVING

The autoclave charge is made up in a weigh tank so a careful record of total charge weight for each batch may be kept. First, any residual ammonia from a previous operation is vented to the scrubber system, after which the dissolver is partially evacuated to prevent atmospheric contamination when the man hole cover is removed. After the dicy is charged and the tool closed, the dissolver is evacuated completely, both as a safety precaution and in order to reduce corrosion.

Methanol-ammonia blend is then pumped to the dissolver, the charge is heated to effect solution, and the solution is pumped to an autoclave.

The charge in the autoclave is heated with high pressure steam in coils and brought to reaction temperature by carefully following a template drawn on a recorder chart. As the polymerization reaction is exothermic, close control of the rate of heating is necessary to prevent development of excessive pressures. Since both yield and quality of finished product are dependent on time and temperature in the autoclave, control of autoclave conditions is by far the most important step in the whole operation.

Steam generated in the boilers at Willow Island is not currently available at a pressure high enough to give the necessary reaction temperature. An auxiliary compressor and accumulator are used to provide the steam required for the high-temperature position of the cycle at present.

At the end of the reaction period, the charge is blown from the autoclave through a cooler into a quench tank.

SLURRY WASHING AND CONCENTRATING

Further handling of the melamine is designed to remove impurities and contaminants and to permit the recovery of the alcohol-ammonia mixture.

The autoclave batch is drowned in either fresh water or in recycled wash water to help remove unwanted by-products and thus avoid contamination of the finished product. The drowned batch is carefully weighed in the quencher and the weight recovered compared with the weight charged to the autoclave. If any sizable heel is found to remain in the autoclave it is removed by washing before the next batch is charged.

The slurry containing suspended solids and total alcohol plus ammonia is pumped through a heat exchanger to a slurry tank, where the mother liquor is separated by decantation.

CENTRIFUGING, DRYING, PACKING

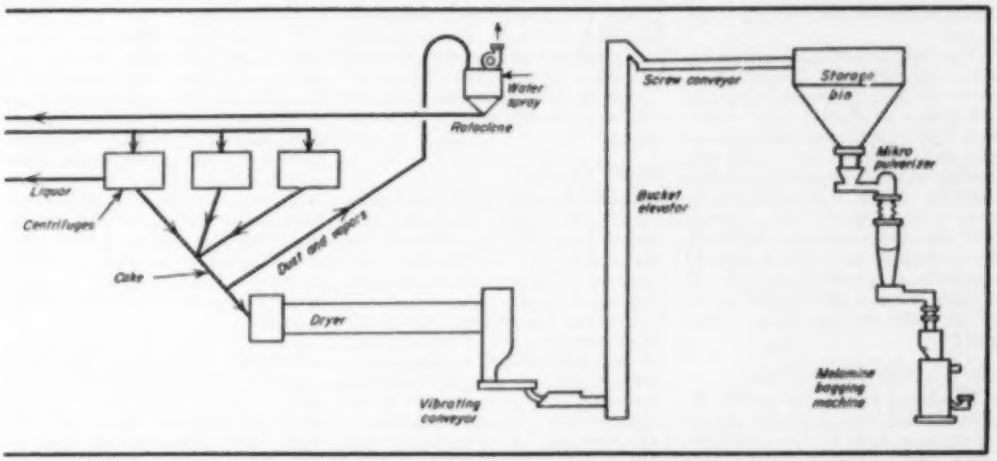
Concentrated slurry from the holding tank is dewatered in over-driven basket centrifuges, where the moisture content is reduced to about 10 percent. Cake plowed from the centrifuges is fed via a chute to a steam-tube rotary dryer. The dry product from the discharge end is cooled in a vibrating cooler-conveyor and then lifted by bucket elevator to a storage bin.

The air from the dryer passes through a Rotoclone where a water spray dissolves any alcohol or ammonia driven from the dryer, and reslurries any solids for return to the slurry holding tank.

Finished melamine from the storage bin is ground as required through a Mikro Pulverizer and packed in 80-lb. paper bags. The bags are stacked on pallets for subsequent movement to the warehouse or direct to box cars for shipment.

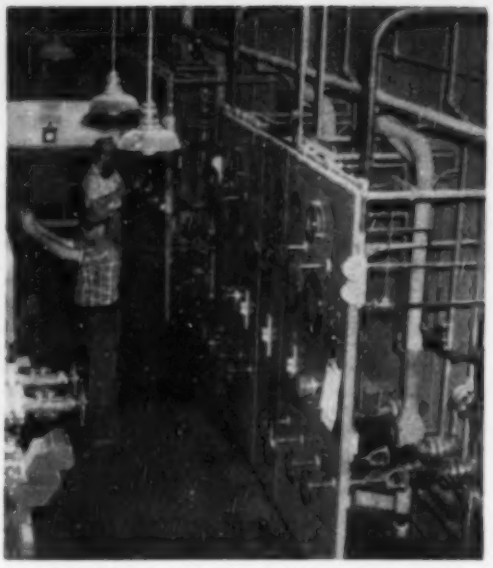
SOLVENT RECOVERY

Vent lines from all pressure vessels as well as the discharge from all vacuum pumps are connected to an ab-



Operations following autoclaving remove impurities and contaminants and permit recovery of the alcohol-ammonia mixture.

Dicy being unloaded from box car via pneumatic conveyor.



Control panels for remote control of autoclave operations.

sorber system consisting of two horizontal absorbers and an eight-plate bubble cap absorption tower. Controlled flow of water to the absorber system and automatic level controllers on the absorbers make possible the recovery of 10 to 20 percent aqua ammonia with virtually no loss. Since the aqua from the absorber system is pumped to the mother liquor storage tank to await recovery, precise control of the water rate is unnecessary, but may be altered from time to time as dictated by the strength of the strong ammonia solution and the rate of operation.

The methanol-ammonia mother liquor is recovered and dehydrated for reuse by open steam stripping and rectification of the vapors at a pressure high enough to permit condensation of a single product stream with cooling water at temperatures readily available. While it is feasible to operate a low-pressure recovery system with two product streams which could be recombined for reuse, the greater simplicity of operating a column with a single product dictated the choice of the latter for the Willow Island plant.

MATERIALS OF CONSTRUCTION

The highly corrosive nature of dicy-ammonia mixtures precludes the use of ordinary steel for the autoclaves. These tools, as well as all other process equipment, pumps and piping from the dissolvers to the packaging equipment are stainless steel or stainless lined, except the solvent storage, handling and recovery systems are all constructed of steel.

While serious corrosion is a problem only during the autoclaving, the use of stainless steel in the balance of the process is a precautionary measure to minimize metal pickup. Extreme cleanliness is necessary throughout, as the finished melamine must meet rigid specifications on turbidity and color of formaldehyde solutions, which go into the manufacture of melamine-formaldehyde resins. The process as set up presents no opportunity for the removal of impurities other than water-soluble byproducts, as the melamine is never taken into solution after it is formed.

SAFETY FEATURES

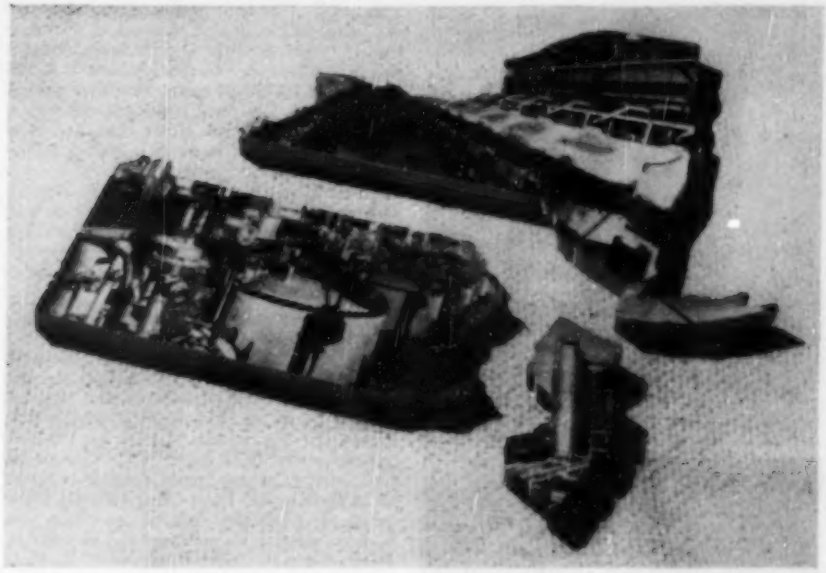
Besides the precautions customarily observed in handling liquid ammonia and a flammable toxic solvent, the high-temperature high-pressure autoclave reaction makes certain other precautions necessary.

Each batch is weighed into and out of an autoclave, and a running record of the weight of heel in that vessel is kept in order to prevent inadvertent over-charging with consequent hydrostatic pressure. Experience has shown that large heels must be washed out, either with methanol-ammonia blend or, in extreme cases, with water before the next batch can be charged to the autoclave.

Because of the exothermic nature of the reaction, careful heating at a rate shown by experience to be safe is essential to avoid excessive pressures. In practice, the autoclave is heated at the rate required to adhere to a template on a pressure recorder chart, as excessive pressure might result in damage to the equipment or loss of an entire batch, whereas an excessive temperature for a limited time would have a less serious effect on yield and quality of the melamine.

To guard against unexpected or accidental departure from optimum operating conditions, each autoclave is equipped with three safety vents. One of these is equipped with two safety disks and a safety valve in series, and protects the equipment against rapid or large pressure rises. The other two vents are manually controlled—one leads to the solvent recovery system and is used for relieving gradual pressure rises, while the other is vented to the roof and is used only as a last resort to prevent blowing the safety disks.

The autoclaves are supported in cells outside the building, with thick masonry walls to protect the inside working area. Outward-opening fire doors must remain closed and no worker may enter the cell while an autoclave is under pressure during its operation.



MIDDLE ATLANTIC STATES

New York, New Jersey and Pennsylvania are the workhorse states of the chemical process industries. Value of shipments from their plants exceeds $9 billion annually. About a third of the nation's chemical and processing units are located within their boundaries. A large part of our research is carried out here.

CHEMICAL ENGINEERING REPORT—APRIL 1950

Birthplace of an industry

Birthplace of the modern chemical process industries, the Middle Atlantic States—New York, Pennsylvania and New Jersey—still supply a great part of the output of these industries. In 1949 about half a million workers were employed in approximately 1,500 process industries plants in these three states. All branches of the chemical process industries are represented in this area. Its large industrial chemical works such as Du Pont's Chambers Works in Deepwater Point, N. J., Esso Standard's Bayway Refinery and the multitude of electrochemical units at Niagara Falls, have 28 percent of the United States chemical process industries.

The three-state area includes such major industrial centers as New York City, Philadelphia, Pittsburgh, Rochester, Buffalo, Niagara Falls, Syracuse, Rensselaer, Bound Brook, Grasselli, Newark, Linden, New Brunswick, Carteret, Perth Amboy, Camden, Rahway, Jersey City—these are names known all over the world where chemical men gather. From the 1,482 plants employing 492,000 people come chemicals, drugs and medicines, explosives and fireworks, fertilizers, glass and ceramics, leather, lime and cement, oils and fats, as well as paints, varnishes, pigments, paper, pulp and board, petroleum, rayon, rubber products, soap, glycerine, cleaning and polishing and related products.

Producers are near big markets

Outstanding reason for the continued large size of the chemical process industries in this area is the ultimate size of the market. With a large portion of the United States population in or close to these three states, it is only natural that these basic industries will continue to thrive. In addition to these factors are the fine

Top administrative center

Administration: New York makes the area king.

Home of Aureomycin

Research: Much is carried out in these states.

One of 1,500 CPI plants in Mid-Atlantic States

Production: Almost 500,000 people work in the area's chemical process industries.

transportation systems including rail, highway and water which connect this part of the country with the rest of the United States, and the World. Included in this area are New York and Philadelphia with two of the country's greatest ports, in fact, New York is the greatest port in the world. Due to the large amount of commerce carried out in this area it is only natural that New York City should remain as the top chemical administrative center in the country. The fast-growing list of major chemical producers in the New York area with either main or administrative offices properly supports this statement. Space does not permit a detailed count of all the firms with top offices here.

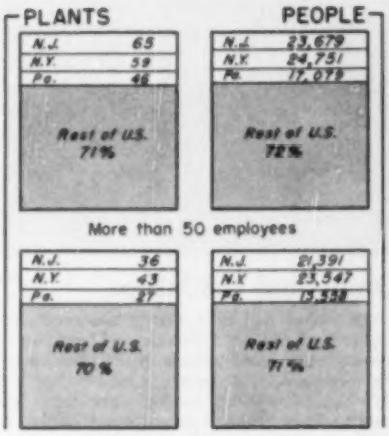
A large part of the research and development work done in the United States finds its origin in the New York metropolitan area. Celanese Corp. of America has a large modern research laboratory in Summit, Esso Standard built a new research center in Linden, N. J., shortly after the end of the war. Johns-Manville has a modern research center at Manville, N. J. Commercial application of atomic energy research is carried on at Brookhaven, Long Island. Merck, Pfizer, American Cyanamid, and many others also maintain modern research facilities in this area. Among the major research centers in the Philadelphia area are Penn-Salt's Whitemarsh Laboratories, Eastern Regional Research Laboratory, Smith, Kline & French's unit. Sharp & Dohme is building a large modern facility at West Point, Pa. These are only a few of the many research units in this vicinity. Pittsburgh, of course, is famous for its Mellon Institute, but more research units are located there. Considerable study of synthetic liquid fuels from coal has been carried out in this area.

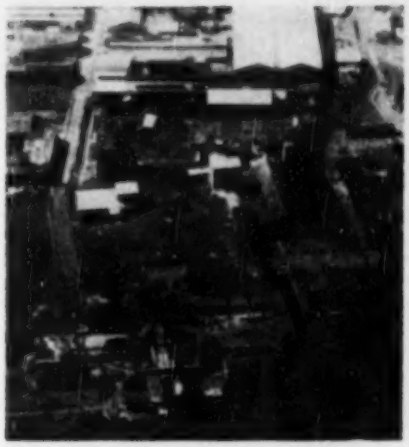
17 Chemical engineering schools are here

Along with fundamental research laboratories this area boasts of 17 top-flight accredited chemical engineering institutions, colleges and universities. This means that these three states have more than one-third of the total accredited chemical engineering courses in the United States.

In order to get a more complete picture of the diverse activities in this region, this report has been broken down into the principal components of the process industries. Through the use of up-to-date tabulations of the number of plants operating in the area, it is possible to see how big a part the three states play in making our chemical process industries a $35 billion per year business that dominates many of the world's markets. The three states contribute more than $9.9 billion to this total. This is almost as much as all of the nation's process industry units produced in 1939.

In this report we show above each segment of the industry, a group of charts showing the percent of that industry located in each of the three states during 1949. Basis for comparison is the number of plants employing more than 50 workers and the number of plants employing more than 100 workers. This is the first time that such statistics have been made available. They are based on an actual "smokestack counting" census of all the manufacturing units in the country.





Westvaco's plant is in the Jersey chemical belt.

Chemicals

30 percent of our chemical plants are here

Almost a third of the plants manufacturing industrial chemicals in the United States are located in the New York, New Jersey, Pennsylvania area. These plants grind out acids, alkalis, dyestuffs, intermediate organic pigments, pharmaceuticals, adhesives and metallic salts. Many plants in this area produce a large variety of products. For example, American Cyanamid's Warners plant at Linden, N. J. produces sulphuric, muriatic and nitric acid, acrylonitrile, aluminum sulphate, ammonium chloride, copper cyanide, ethyl lactate, ethylene cyanohydrin, guanidine salts, insecticides, prussiates, salt cake, sulphur, rubber chemicals and xanthates.

American Cyanamid Co. has ten major plants in the three-state area. They include Calco Division's plants at Bound Brook, Gloucester City, N. J. and Newark, N. J. Lederle Laboratory Division is at Pearl River. Cyanamid also has a unit at Woodbridge, N. J. In Pennsylvania it has plants at Bridgeville, Latrobe and New Castle.

Du Pont has 27 plants in these states

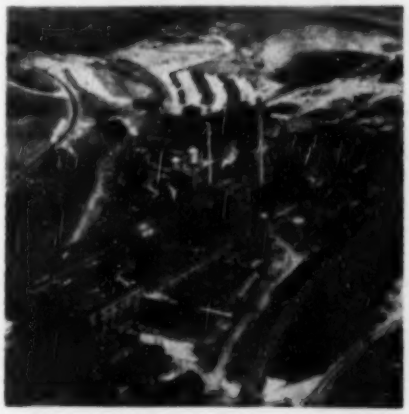
Du Pont is well established in this area with 27 plants in various localities. Every major Du Pont department has at least one plant located in the Middle Atlantic area. The firm has plants at Philadelphia, Niagara Falls, Perth Amboy, N. J., Fairchance, Pa., Gibbstown, N. J., Moosic, Pa., Peckville, Pa., Howard Junction, Pa., Irvine Mills, N. Y., Carney's Point, N. J., Newburgh, N. Y., Grasselli, N. J., Lydonville, N. Y., New Castle, Pa., Paulsboro, N. J., Philadelphia, Pa., Deepwater Point, N. J., New Brunswick, N. J., Parlin, N. J., Rochester, N. Y., Towanda, Pa., Newark, N. J., Buffalo, N. Y., and Illion, N. Y.

Allied Chemical & Dye Corp. is well established in this area. Their General Chemical Division has seven plants scattered through the three states. Their Barrett and Solvay Divisions are also represented in these states.

The electrochemical industry around Niagara Falls is considerable. Du Pont, Hooker Electrochemical, Mathieson, Carbide, Niagara Alkali and Stauffer Chemical are among the major electrochemical producers at Niagara Falls.

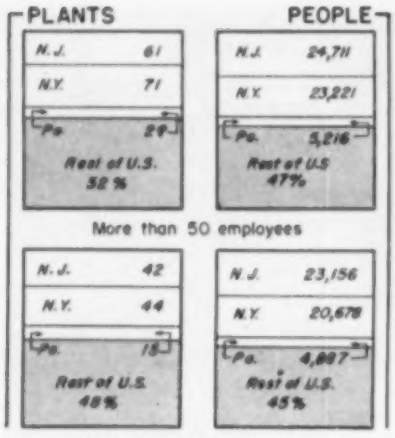
Rail and water routes are handy

Bakelite has one of the area's big resin plants.

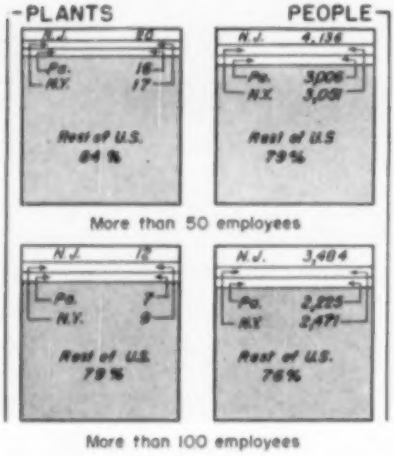


Cyanamid's Bridgeville plant is only one of its 10 major units in these states.

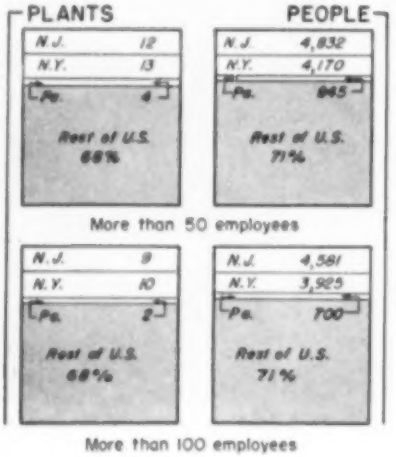
Drugs and medicines: half our plants are in the Middle Atlantic States



Fats & oils: a fifth of our plants are in the Middle Atlantic States



Soap and glycerine: a third of our plants are in the Middle Atlantic States



Drugs and Medicines

More than half of our drugs and medicines are made in this area. There are 152 plants employing 50 or more workers in the three states. They employ 53,000 people. One hundred and one of these plants employ more than 100 people. These plants represent about 52 percent of the producing units in the United States. Among the major drug and chemical producers in this area are American Cyanamid's Lederle Division, Merck & Co.'s plant at Rahway, Charles Pfizer & Co. in Brooklyn, Ciba Co. in Summit, N. J., Hoffman LaRoche in Nutley, N. J., Sterling Drug with plants at Springville, Brooklyn and Rensselaer, N. Y., Vick Chemical and E. R. Squibb & Sons, Brooklyn.

Another pharmaceutical, drug and medicinal firm is Bristol-Meyers Co., Newark, N. J. and Syracuse, N. Y. In Trenton, the Bayer Division of Sterling Drug boasts one of the most modern aspirin plants in the United States.

Schenley operates a modern research and development section in addition to its medicinal chemicals plant in New Jersey and, one of the major medicinal and fine chemical plants in the New Jersey area is J. T. Baker Chemical Co. in Phillipsburg, N. J. Among the biggest drug and medicine producers in Pennsylvania are Sharp & Dohme with plants in Delaware and Philadelphia counties, and Smith, Kline and French Laboratories in Philadelphia. Wyeth, Inc. and National Drug Co. have units in the Philadelphia area.

Major reasons for the concentration of the drug and pharmaceutical industry in the New York area are the ready availability of raw materials, labor, transportation, and most of all a ready access to markets in the form of a large population. In addition, the modern drug and chemical industries are rooted in the synthetic dye industry, which got its American start in the vast meadows of New Jersey, just outside New York City, during World War I. At that time with the pressure for organic chemicals on the upgrade and the supplies from foreign countries, notably Germany, shut off, several American firms jumped into the gap and in a short time a vast chemical empire sprang up in the northern New Jersey area. As the nation's chemical markets expanded, so did the metropolitan New York chemical industry. With the large number of technical personnel available in this area, it was only natural that the major part of the drug and medicinal industries should spring up around their flourishing dyestuffs counterpart.

Rooted in the old dyestuffs industry

Once established it continued to wax and grow strong in the Middle Atlantic States. This is predominant reason for the present strength of the Middle Atlantic area in the drug and medicinal chemical field. Moreover, the region is not standing still and with New York State alone commanding 23 percent of the total number of plants it can be expected to remain in the dominant position for some time to come.

Fats and Oils

Seaports helped an industry grow

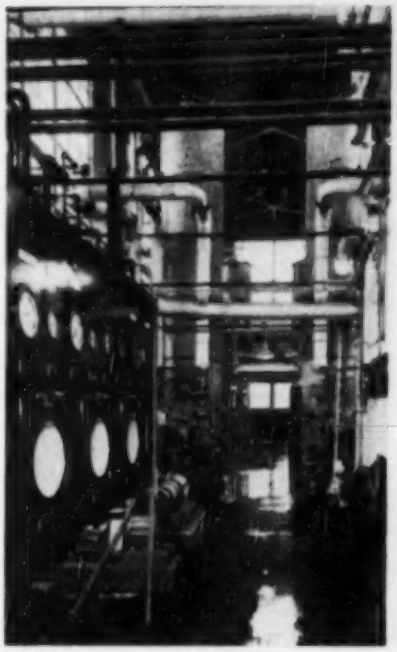
About 15 percent of the plants producing fats and oils in the United States are located in the concentrated New York, New Jersey, Pennsylvania area. According to the 1947 census, Pennsylvania and New York are among the top five states from the standpoint of total number of plants in the area. Here the ready availability of seaport facilities in import of crude oil has built up one of the major oil and fat centers in the country. The linseed oil business is represented by firms like Archer-Daniels-Midland Co., and Spencer Kellogg & Son at Edgewater, N. J., Bisbee Linseed Co. and others. National Oil Products has a plant in Paterson. E. F. Drew, American Cyanamid Co., Woburn Chemical Corp., Baker Castor Oil Co., Dodge & Olcott and other firms employ about 10,000 people, or 21 percent of the total worker population of the oils and fats industry. From these units come all types of animal, vegetable, fish and essential oils for use in the multitude of consuming markets throughout the nation and the world. Prior to the war when imported flaxseed was the main source of our linseed oil output, the New York harbor area was the major producing section for this essential component of the paint industry. However, with the growth of the domestic crop of flaxseed, the Midwest has taken over a large part of this segment of the oil and fats business. While it has lost ground percentagewise, due to the development of many new plants outside this region, it continues to be an important part of our oils and fats economy.

Soap and Glycerine

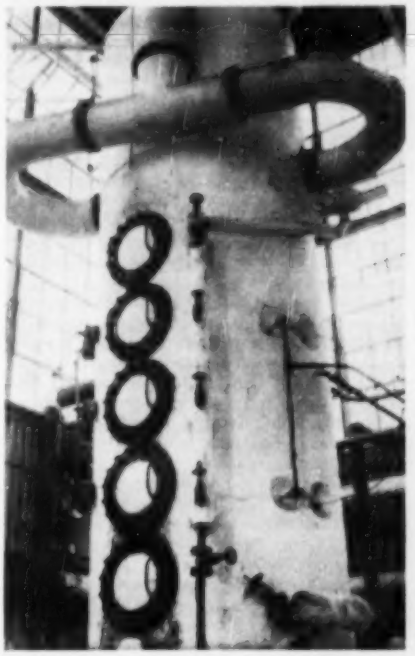
Almost a third of the soap, glycerine and cleanser producers are in the Middle Atlantic States. With about a quarter of the nation's population living within 250 miles of New York City, it is only logical that a good part of the soap industry should have developed and grown strong in this area. Among the major soap manufacturers in this area are Procter & Gamble, Colgate-Palmolive-Peet, B. T. Babbitt, Inc., Armour & Co., Dodge & Olcott, Yardley Co., Ltd.

Many plants are small

According to the 1947 census, New York had 214 plants engaged in production of soaps, glycerine, creams, polishing and related products. New Jersey had 111 units, and Pennsylvania had 102. However, in 1949 there were only 29 plants employing more than 50 people in all three states. There were only 21 plants employing more than 100 people each. Thus it can be seen that the soap industry, along with the paint, varnish, and lacquer industry, has a

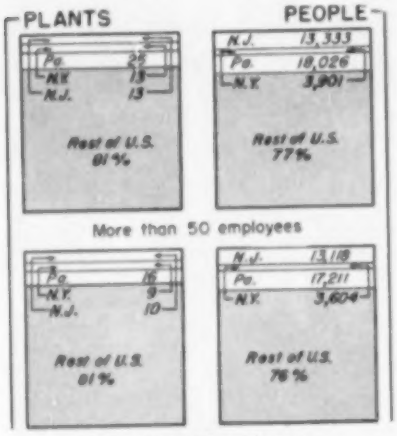


Fine and heavy chemicals flow from plants that are distributed throughout the three states.



Fats and oils are treated in plants employing about 20 percent of the industry's workers.

multitude of small plants in this area. However, the relatively small number of larger units (those employing more than one hundred people) still account for about 40 percent of the large soap and glycerine plants and cleansing producers in the United States.



Petroleum Products

More than 18 percent of the larger petroleum products industry plants are located in the Middle Atlantic region. Almost 16 percent of the country's petroleum refining capacity is in the area's 33 refineries.

Firms like Atlantic Refining Co., Gulf Oil Co., Sinclair Refining Co., Sun Oil Co., Cities Service Co., Esso Standard Oil Co., Shell Oil Co., Socony-Vacuum Co., Texas Co., and Tidewater Associated Oil Co., are only a few of the large petroleum firms with refinery and storage facilities in this region. The 19 refineries in Pennsylvania have a capacity of 465,500 bbl. per day, the New Jersey refineries have a capacity of more than 394,000 bbl. per day and six New York state refineries have a capacity of 94,000 bbl. per day.

While the percentage of oil refined in the Middle Atlantic area has fallen off from 21 to 14 percent in the past 25 years, the growing trend toward imported crude oil may well mean an upswing of refining operations in the East Coast. Experts estimate that about 10 percent of the total crude demand will come from imported sources this year.

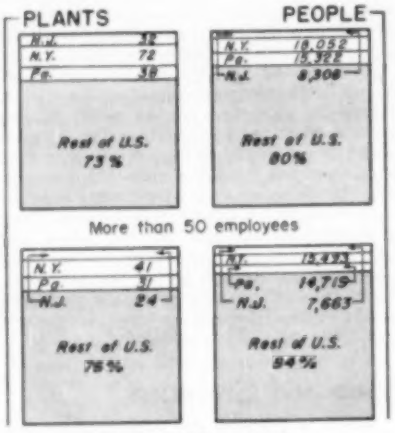
Headquarters for many oil firms

Headquarters for a large portion of the major petroleum refinery companies are located in this region. Shell Oil Co. recently moved the headquarters of its chemical company subsidiary, Shell Chemical Corp., into the area. It has set up new headquarters in New York. Standard Oil of California has also developed considerable interest in the eastern market and a subsidiary, California Refining Co., is operating a refinery in the Perth Amboy region of New Jersey. Last year Arabian American Oil Co. also transferred its headquarters operations from San Francisco to New York. This movement of major oil producing firms into the New York metropolitan area contradicts the opinion of some pessimists that the East is "dying on its feet and will pass out of existence in the next 50 years as a major industrial center."

Big markets are nearby

As far as the oil refining industry is concerned, the heavy population combined with the high demand for industrial grades of fuel oil, petrochemicals and home heating fuels, is ample to keep the existing capacity in operation and has encouraged expansion in these areas by several of the major refineries.

This area was the birthplace of modern oil-well operations. And Pennsylvania and New York still produce about 16 million barrels of crude oil per year. However, this is only a small fraction of the total U. S. crude production at the present time (last year's crude oil production was 1.84 billion barrels). A large part of the business conducted in the Middle Atlantic States depends on the healthy export market. Products of the petroleum industry are no exception. Therefore, a large factor in the future growth of the petroleum refining industry in this area will be the future size of the export markets for refined petroleum products.



Paper and Pulp

142 pulp and paper plants

One of the major chemical process industries in the Middle Atlantic area is the pulp and paper and board industry. More than 140 plants (27 percent) of the nation's pulp and paper units employing more than 50 workers each are located in this region. The tremendous demand for the basic raw materials in packaging, printing and publishing has made this a really big business in this area. Thousands of manufacturers whose products are small and light package them in paper. This has created a demand for paper products unequaled anywhere. Paper boxes, bags, cardboard containers, cartons, packages and wrapping paper are required in large volume. Since newspaper constitutes a major source for paperboard, and this is abundantly available in

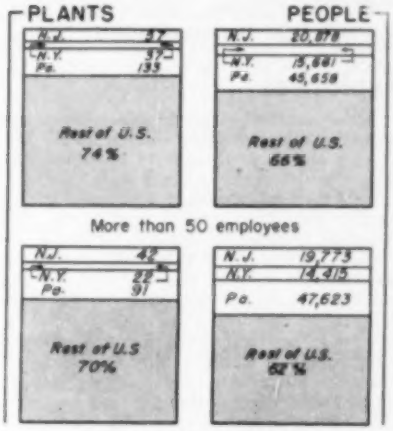
the thousands of tons of waste paper baled daily in the major cities of the area, the raw material for the paperboard mills comes primarily from their ultimate consumer. The pulp and paper mills also find a ready market in the printing industry of the state producing far more than its share of the printing carried out in the country.

Plenty of raw material

In New York State these mills are located in the northern part of the state convenient to the Adirondack forests and in the western part of the state where pulpwood arrives by boat. As demand for paper has increased yearly, these mills are converted from the cheaper grades of paper, like newsprint, to the higher quality book papers, bringing them more dollars for each ton produced.

Firms like St. Regis Paper Co., West Virginia Pulp & Paper Co., International Paper Co., Kimberly-Clark Corp., Crown Zellerbach Corp., Scott Paper Co., are only a few of the world famous names producing pulp, paper and board in this area.

With 27 percent of the nation's pulp, paper and board plants in this region, it ranks as the largest in the United States. And bids fair to remain one of the top areas in the country for some time to come.

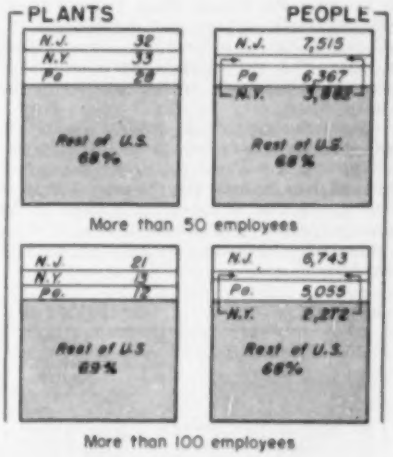


Glass and Ceramics

380 plants employ 80,000 workers

There are more than 380 plants producing glass and ceramics in these three states. More than half of the largest plants (those employing more than 100 people) were operating in the Middle Atlantic area in 1949, according to the McGraw-Hill census. A detailed breakdown shows the impressive size of the industry in this region. More than 80,000 workers were employed in this major glass and ceramic plant. Firms like Corning Glass Works, Pittsburgh Plate Glass Corp., Owens-Illinois Glass Co., and Libbey-Owens-Ford are only a few of the major firms with sizable plants scattered throughout New Jersey, New York and Pennsylvania. All types of glass and ceramic operations are represented here.

New York State, with seven mines, is the leading domestic producer of industrial talc, a leadership which is expected to hold for the rest of the century. About 20 percent of the yearly output of New York talc goes into the ceramic industry.



Paints and Pigments

Most plants are small

Plantwise, New York is the kingpin of the paint, varnish, pigment and allied products industry. New Jersey ranks third in the country, and Pennsylvania is sixth. About one-third of our paint-varnish industry is located in the region. There are about 450 plants in these three states. However, only about 93 of these plants employ 50 or more people. It can therefore be seen that only a few of the total number of units are of any considerable size. However, the area holds its own percentagewise, even among the larger plants. The 46 plants employing more than 100 employees each represent 31 percent of the nation's plants in this size category. Among the big firms in the paint, varnish and lacquer industries represented here are Du Pont (with plants at Newark, Philadelphia and Parlin) Hilo Varnish Co., National Gypsum Co., Pratt & Lambert, Inc., National Lead Co., New Jersey Zinc Co., Bakelite Corp., Sherwin-Williams Co., Benjamin Moore & Co., Pittsburgh Plate Glass Co., Vita-Var Corp., Glidden Co., and Calco Chemical Division of American Cyanamid Co.

With the continued construction boom and tremendous industrial paint market in the Middle Atlantic and adjoining region, this area should continue to maintain its dominant position in the industry.

Rayon

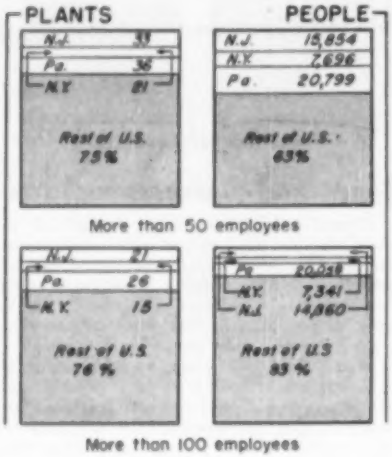
With New York producing about half of the nation's clothing, it might be expected that a considerable part of the rayon and allied products should be located near its consuming market. However, New York has only 4 of the 33 plants in the United States. New Jersey has no

rayon units, but Pennsylvania has three. Raw material and other considerations have kept the ultimate size of the industry to 27 percent of the plant employing more than one hundred employees each.

Three plants in Pa.

American Viscose Corp. has the three plants in the Pennsylvania region. They are located at Lewiston, Pa., Marcus Hook, Pa., and Meadville, Pa. Du Pont has a unit at Buffalo, N. Y., and Skenandoa Rayon Corp., has a viscose plant at Utica. Thus the industry is represented by 27 percent of the plants producing rayon in the United States.

While this region will probably continue to lose ground as a producer of synthetic fibers percentagewise, it will continue to hold the units it has and may expand. But the general trend of fiber production to the other sections of the country appears to be continuing in spite of the concentration of clothing production in the Middle Atlantic area.

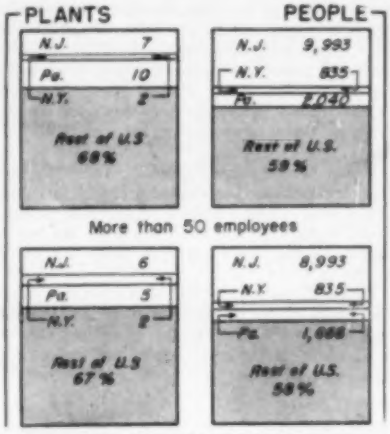


Leather

A quarter of our plants are in these states

A quarter of our leather industry's big plants operate in these states. Forty plants with more than 100 employees each are keeping the leather industries operating at a good rate. While all three states have a multitude of plants employing more than 50 people, Pennsylvania has the most—with 31 plants in this category. In the 1947 Census of Manufactures there were a total of 200 leather plants of all sizes in these three states. Together the Middle Atlantic states stand far above all other regions. However, Massachusetts is the top state (182 plants) in the country in terms of total number of leather firms. It is followed by New York (29 plants), New Jersey (58 plants) and Pennsylvania (43 plants). These four states contain two-thirds of the country's leather industry plants.

The location of these states makes them especially well suited for the large flow of imported hides into the eastern seaboard. This plus a ready supply of domestic and imported tanning material has kept the northeastern states supreme in this part of the process industries. Originally the industry got its start with the use of oak bark for vegetable tanning processes. However, as the chrome tanning process and other vegetable extracts began to be used as tanning agents, the ready accessibility of transportation and markets kept the region's leather industry prosperous.



Explosives

A third of the plants are here

About one-third of our largest explosives and fireworks plants are found in these states. Employing almost 9,000 workers 13 plants with more than 100 employees each make up 33 percent of the total number of unit plants of comparable size. Two of these units are in New York, five in Pennsylvania and six in New Jersey.

Hercules Powder, D Pont, Atlas Powder, all have plants in the area. One reason for the large number of plants in this vicinity is the prevalence of mining operations which, of course, consume a large part of the explosives. Another large explosives outlet of considerable importance in this area is the quarrying industry. These factors together with the large amount of construction carried on in the Middle Atlantic States indicate the economic reasons for locating here. Eight out of 22 Du Pont explosive department plants are located in these three states.

Rubber

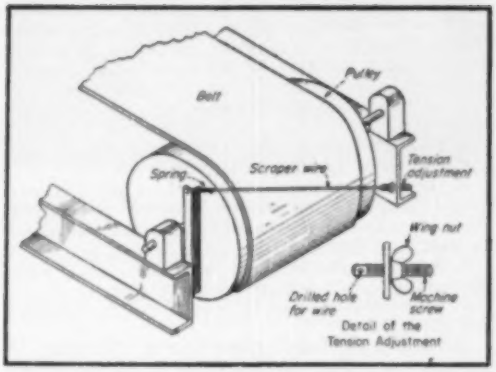
100 plants hire 44,000 people

When people think of rubber they generally think of the concentration of plants in the Akron and other Midwest locations, as well as the synthetic rubber plants in the Southwest. However, more than 44,000 people are employed in almost one hundred rubber products plants in the Middle Atlantic States.

The majority of the rubber products plants in the Middle Atlantic area produce various types of industrial and other forms of commercial rubber products. The great diversification of rubber products in this area has kept the outlook for this division of the chemical process industries tied to the steady growth of its markets.

The Plant Notebook

THEODORE R. OLIVE, Senior Associate Editor



Simple Belt Unloader Handles Both Troughed and Crowned Conveyors

GEORGE T. AUSTIN, Associate Professor of Chemical Engineering, The State College of Washington, Pullman, Wash.

★ February Contest Prize Winner

Belt conveyors operating on dry and granular solids rarely offer any difficulty in unloading. However, when it becomes necessary to unload a material such as a wet filter cake which has any tendency to stick to the belt, some type of belt scraping cake remover becomes a necessity. For such a scraper to do a satisfactory job, the pulley against which it scrapes must be entirely free of any crown and the belt must show no tendency to crown or trough, for such belt conditions will either make it impossible for a flat knife to scrape clean or will cause the knife to wear away the belt. It is usually desirable, however, to carry a slight crown on the pulley in order automatically to center the belt. Belts often trough slightly on being bent around a pulley, so that a belt which is truly flat to a scraper is quite rare. Belt scrapers, therefore, tend to be troublesome.

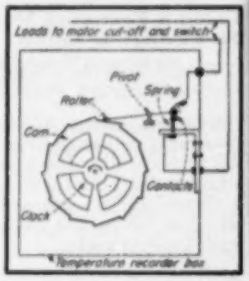
The use of a wire scraper operating under slight spring tension provides a splendid solution to this problem. Because of the application of the wire at an angle to the horizontal, as shown above, the device accurately follows the troughed or crowned contour of the belt. Because the tension is light, there is but little friction to wear away the belt. The whole device is much less expensive than a conventional scraper while the wire can be easily and cheaply replaced, and is practically self-adjusting.

If there is any tendency for the cake to stick again to the belt after being loosened by the wire, the wire can be applied low enough on the pulley to cause the cake immediately to fall away after being scraped loose. Under normal conditions of operation on non-abrasive solids, wire replacement is rarely more frequent than twice a year, particularly since the whole device can be made of highly corrosion resistant material.

Automatic Timer Controls Chemical Supply Pumps

JOHN W. MCCLELLAN, Assistant Testing Engineer, Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

In the accompanying sketch I have shown an automatic timer which we designed and built for cutting on and off a chemical pump. The pump supplies a chemical solution which is pumped into the suction line of a feedwater pump. It was desired to pump in the solution for a 15-min. period out of each 2 hr., handling a total of 2,000 gal. of solution per day.



The timer consists of a clock-driven cam and switch arrangement, with the cam designed to cut in the pump for about 15 min., and cut it out for about 1 hr. and

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★ MARCH PRIZE WINNER—A $50 prize will be issued to . . .

ALFRED H. McKINNEY
Chemical Engineer, Philadelphia Quartz Co., Philadelphia, Pa.

. . . for an article which describes a number of methods of converting the pressure output of pneumatic controllers into adjustments for electrical circuits, primarily for controlling electric furnaces and other heaters. Winner of the March contest, the article will appear in the May issue.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

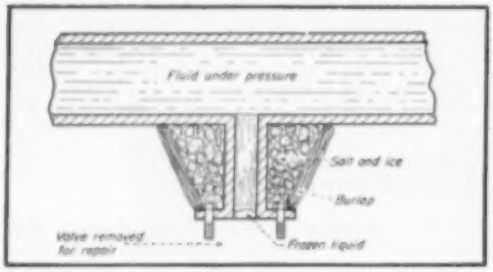
The winner each month will be announced in the issue of the next month, e.g., the April winner will be announced in May and his article published in June. Judges will be the editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at usual space rates.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible.

Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data, as well as new cost-cutting ideas, are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

45 min. in each 2 hr. of the 24-hr. day. In our case the clock is set to pump on the even hours, 10, 12, 2, 4, and so on. For this purpose a cam was cut out with a saw and a file and mounted on the shaft of a 24-hr. clock taken from a venturi meter. The movable contact consists of a pivoted arm with a roller in contract with the cam. The contact buttons are made of brass machine screws covered with silver solder. The fixed contact is spring-mounted so as to "give" when the cam follower is on the high point.

The device can be readily adjusted to make contact for the desired part of each 2-hr. period, either by bending the contact arm or by moving the fixed contact. This adjustment can be made conveniently with a light or bell and battery set before connecting to the motor of the pump. In operation the timer makes contact shortly before the cam reaches the high point, and terminates contact when the roller drops off the high point. The timer was installed inside a temperature recorder box and has been in operation for 2 years without a breakdown.



Using a Freezing Mixture To Change a Valve

C. Robert Ruffing, *Chemical Engineering Student, University of Pittsburgh, Pittsburgh, Pa.*

A freezing mixture will sometimes do the trick when it is necessary to change a valve under pressure. Whether this method can be used depends, of course, upon the fluid being handled. Just pack the mixture of salt and water ice—or chipped dry ice—around the branch pipe, holding it in place with burlap. The line can easily be thawed after the repair has been made.

How to Insure Good Operation of Bucket Steam Traps

A. W. Lloyd, *Chemical Engineer, Cullercoats, Northumberland, England.*

Both during the war and more recently the subject of good operation of bucket steam traps has received a lot of attention in England, on account of the continuing fuel shortage, but the advantages of a well maintained trap system are by no means limited to fuel economy. I think, therefore, that the maintenance pointers enumerated here—most of which I have experienced personally—should be of equal interest to engineers in the States.

If a trap of the bucket type appears sluggish, if it has ceased action, or if it has never operated satisfactorily, look for:

1. Choked inlet line. The strainer may have been cleaned, but the line leading to it may not have been cleaned.

2. Punctured strainer. Dirt can cause seizure of the valve mechanism if it lodges between valve and guide.

3. Vent hole plugged. This applies to inverted bucket traps. The steam has to condense instead of escaping and air may accumulate and prevent the fall of the bucket.

4. Trap cover lagged. The cover of a bucket trap can not be lagged since the steam escaping through the vent must condense.

5. Wrong valve size. This may result from a change in pressure of the steam supply without a corresponding change in the valve to allow for the altered differential pressure across the trap. If the pressure has increased the float may be too light to open the valve. If pressure has been decreased, the discharge rate will of course be reduced.

6. Inadequate pressure. Full pressure at the trap may not be available, especially at start-up.

7. High back pressure. The lift from the trap may be too great; the condensate line may be too small; or the line pressure too high owing to inadequate venting or to other traps that discharge into it blowing steam.

8. Breakage. Bucket levers break sometimes, while the simpler types of linkages may come loose.

9. Body tilted. Friction is increased and the float may foul the body.

10. Dirt in the body. Heavy scale in the bottom of the body can prevent the bucket from falling low enough to open the valve fully.

11. Trap too small. The trap may have been designed for average operation, rather than start-up. Some manufacturers base ratings on cold water discharge, giving overly optimistic results.

12. Steam locking. The condensate line to the trap rises, permitting steam to pass after the condensate so as to hold up further flow to the trap.

13. Wet steam. The steam supply to the heating unit may be wet for a variety of reasons, such as priming of the boiler, or the failure of other traps to operate properly, especially on flash tanks, which will then overflow.

14. Dirty heating coils, or steam passing trap. If a trap on a heating coil is passing steam heavily and the supply is superheated, a slight superheat may reduce the heat transfer rate, while a higher superheat may result in baking a heat insulating layer on the coils.

15. Float and valve assembly out of adjustment. If the float fouls the side, this may often be due to the operator's tampering with the valve nut where one is fitted.

16. Float is too light. May come from loss by corrosion, or error in initial assembly of trap.

If the trap is passing steam, look for:

17. Scoring of the valve or seat.

18. Bypassing of the valve. If the valve seat screws into the body, steam may be passing through the threads. Where the valve makes a face-to-face joint with the cover, a sealing paste should be used.

19. Float too heavy. This will prevent valve closure.

20. Float and valve assembly out of adjustment as in (15).

21. Bridging. Where condensate enters the side of the body and passes into the cover, leaving a narrow bridge between entry chamber and body space, the cover joint may be below here. Check the faces in this case for erosion.

22. Faulty float mechanism adjustment. Full rise of the float, as far as the cover, may not allow valve closure.

23. Eroded siphon. In the bucket type the discharge siphon may erode at the bend, permitting bypassing of the valve. Excessive air venting into this line can also give a similar effect.

Avoiding Hazard From Beryllium In Fluorescent Powders

PAUL C. ZIEMER, *Oak Ridge, Tenn.*

Since 1938 when beryllium first began to be used in large quantities in the United States for the making of fluorescent powders, observers have found evidence of beryllium poisoning among workers engaged both in the extraction of the metal from its ores and in the handling of beryllium-base lamp phosphors. This led to considerable study, with the result that large plants which produce, process and utilize such substances have all instituted safe practices in plant housekeeping and hygiene that fully protect the labor force.

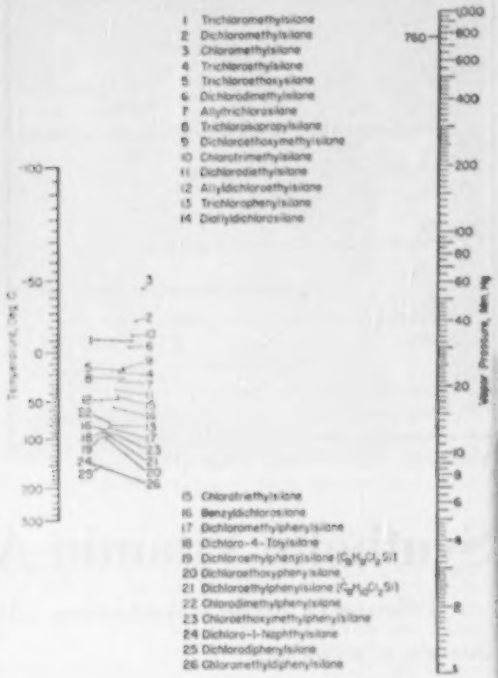
In addition, however, the widespread use of fluorescent lamps has led to some concern for fear that lamps users may be exposed to hazard through careless disposal of the burnt-out tubes. The National Safety Council has pointed to several possible hazards from fluorescent tubes, including: (1) Dust and broken glass from a fluorescent tube may be inhaled by workers; (2) cuts and scratches from the glass may become impregnated with the compound; (3) mercury vapor, also present in fluorescent tubes, may be inhaled.

HOW TO BE SAFE

Several ways have been adopted for the disposal of the burnt-out tubes, some of which are not recommended. It is poor practice, for example, to dispose of them in a furnace or boiler plant, both because of the danger that the light glass envelopes may explode in the heat of the boiler before the door can be closed, and because the disposal of large numbers of tubes in this way may lead to serious clinker troubles from the congealed glass. Burial in deep trenches is effective if the tubes are carefully covered and the public is excluded. Breaking the tubes under water while wrapped in burlap is a fair solution to the problem, but a nuisance, since the tubes float and must be held under.

One of the most satisfactory disposal methods is the one illustrated here, in use in our plant. The machine shown is a disused carbon crusher which was converted with a minimum of effort. The garden hose shown supplies tap water in the feed hopper to keep down the dust hazard. The left-hand receptacle shown is receiving the well-wetted debris, where the water drains off to the storm sewer. The solids are then retrieved for burial with other unwanted chemicals.

To make sure that the old tubes are handled safely we have provided special labeled receptacles in the plant for the storage of the old tubes. At intervals these are hauled to the crusher and emptied, thus saving unnecessary handling by the refuse men.



Nomograph Gives Vapor Pressures Of Organochlorosilanes

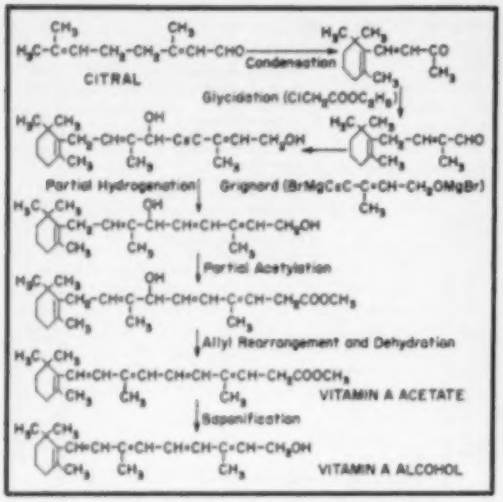
W. M. HERRING, JR., *and* D. S. DAVIS, *Respectively, University of Wisconsin, Madison, Wis., and Virginia Polytechnic Institute, Blacksburg, Va.*

Use of organochlorosilanes as water repellant agents in the treatment of cotton cloth necessitates their vaporization and suggests the need for convenient presentation of pertinent vapor pressure-temperature data. For these compounds, data assembled by Stull[2] show linearity of the logarithm of vapor pressure with the reciprocal of absolute temperature, in accordance with the integrated Clausius-Clapeyron equation, $\log p = A + B/T$, where p = vapor pressure, millimeters of mercury; T = absolute temperature, deg. K.; and A and B are specific to the compound.

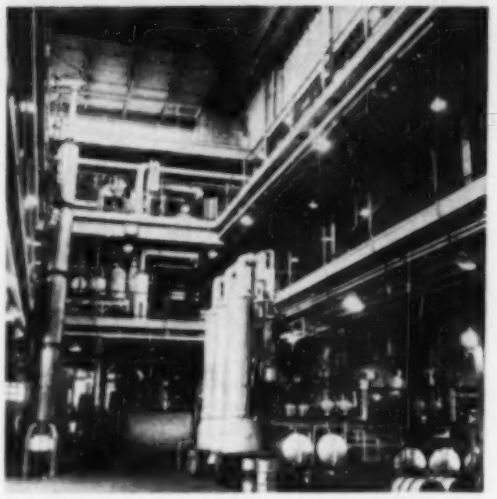
The use of the accompanying line coordinate chart, designed to represent these data and constructed by methods described previously,[1] is illustrated as follows: What is the vapor pressure of dichlorodimethylsilane at 20 deg. C.? Connect 20 on the temperature scale with 6, the gage point for dichlorodimethylsilane, and produce the line to the vapor pressure scale where the desired value is read as 107 millimeters of mercury. What is the boiling point of dichloromethylsilane? Connect 760 on the vapor pressure scale with 2, the gage point for dichloromethylsilane and read the boiling point as 40 deg. C.

REFERENCES

1. Davis, D. S., "Empirical Equations and Nomography," Chap. IX, New York, McGraw-Hill Book Co. (1943).
2. Stull, D. R., *Ind. Eng. Chem.*, **39**, 517 (1947).



Twelve-step synthesis: Vitamin A built up from citral.



Main plant: Builds C_{20} molecule (first 8 steps of process).

Synthetic Vitamin A

Hoffmann-La Roche is synthesizing billions of units of high-potency vitamin daily

JOSEPH A. O'CONNOR

Only a little over 1,000 days after it first reported a successful laboratory synthesis, Hoffmann-La Roche Inc. was offering high-potency synthetic vitamin A in quantity at a new low price. On Aug. 31, 1947, Dr. Otto Isler made known to Swiss chemists assembled in Geneva that Roche researchers had worked out a synthesis for producing vitamin A. On Feb. 6, 1950, Paul J. Cardinal, vice president of the company's vitamin division, announced that a big new plant at Roche Park in Nutley, N. J., was turning out tons of synthetic vitamin A, that Hoffmann-La Roche was selling it for 30 c. per million units. Elapsed time: 1,011 days.

VOLUME PRODUCTION

Daily production of vitamin A at the new plant is in billions of units. Preliminary work got under way at the end of 1947, and ground was broken early in 1948. The plant, which cost hundreds of thousands of dollars, took two years to build. Most of its equipment has been specially designed.

Principal raw material is citral, which comes from lemon grass, much of it from India. Other starting raw materials include formaldehyde and acetic acid.

TWELVE STEPS

As are many fine chemicals and pharmaceuticals, synthetic vitamin A is produced by a batch process. Virtually every one of the 12 steps in the Hoffmann-La Roche process represents a brand new modification of some unit process. So it's easy to understand his reasons when Dr. A. J. Frey, vice president in charge of manufacturing, points out that only the barest outlines of the process can as yet be revealed.

Essentially, here's how the vitamin A is synthesized: four carbons are added in two steps to the citral, which is a C_{10} compound, to form a C_{14} intermediate; meantime, a C_6 side chain is being built up; this C_6 side chain is hooked to the C_{14} intermediate, thus completing the C_{20} structure of the vitamin A molecule. It takes eight of the 12 steps in the synthesis to build up this C_{20} structure. All eight are carried on in the new vitamin A building at Roche Park. The remaining four steps are accomplished in the nearby development building, which is, in effect, a large, highly flexible pilot plant.

ADDING FOUR CARBONS

In the first step, the citral, a C_{10} compound, undergoes a condensation that results in a C_{14} compound. Next comes an isomerization, and then the third step, a glycidation, adds one more carbon, changing the C_{14} to a C_{15} compound.

BUILDING UP SIDE CHAIN

In the next four steps, the C_6 side chain is built up. The fourth and fifth steps involve cracking; the sixth, acetylene addition; and the seventh, isomerization. Finally, in the eighth step, a Grignard reaction hooks this C_6 side chain to the C_{15} compound and the C_{20} structure of vitamin A is completed.

FINAL STEPS

Last four steps involve esterification, selective hydrogenation, molecular rearrangement and dehydration. Vitamin A acetate is produced. The vitamin A acetate is also converted to vitamin A alcohol and reacted with a derivative of palmitic acid to form vitamin A palmitate. The palmitate ester is apparently more stable in aque-

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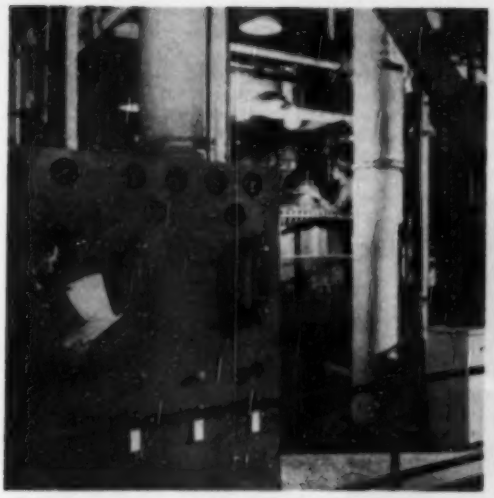
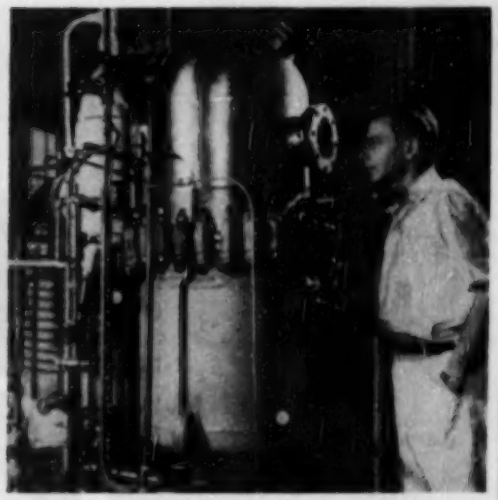
JOE O'CONNOR, *News Editor, and* SID KARSON, *McGraw-Hill photographer, made their visit two days after Hoffmann-La Roche announced commercial shipments of synthetic vitamin A.*



Side-chain area: C_6 is carefully hooked onto C_{14} structure.



Vacuum purification equipment: Final operation, super secret.

ous dispersion than the acetate and alcohol of vitamin A. These last four steps are carried on in the development building, where intermediates from the new vitamin A building are converted into vitamin A and the product is finally purified.

PURIFICATION

Final operation in the production of vitamin A is purification, called "polishing" by the Roche technicians. In a specially designed piece of equipment, final traces of solvents introduced during manufacture are removed under vacuum. Since the material is heat-sensitive, this is a ticklish job. For to insure clear light color, it must be ridded of even the slightest turbidity, but none of the product must be decomposed or taken off with the impurities.

This final purification takes place at about 50 deg. C. Polishing is carried out under vacuum. Last traces of such solvents as pyridine, toluene and petroleum ether are removed, but no vitamin A is lost.

PRODUCT

Finished vitamin A palmitate and acetate are kept in a refrigerator at −5 deg. C. Containers used in the plant, incidentally, are standard Swiss milk cans hermetically sealed.

As a final added precaution, finished vitamin A is sealed under nitrogen in the seamless aluminum bottles in which it is shipped. Light in color, the product is, unlike the vitamin A from fish liver oils, almost odor- and taste-free. And it's high in potency: the acetate in corn oil is standardized at 1,000,000 USP units per gram; the straight palmitate, at 800,000 to 1,000,000 units.

OTHER PRODUCERS

Hoffmann-La Roche is not alone in the manufacture of synthetic vitamin A. Chas. Pfizer & Co. and Merck & Co. are also getting into this business. Pfizer expects to be in volume production at Groton, Conn., soon. Merck is completing facilities at Rahway, N. J., for large-scale production of vitamin A. Both companies have turned out pilot-plant quantities. And Distillation Products, Inc., Rochester, N. Y., using a different process, also produces synthetic vitamin A.

MARKETS

Most promising market for synthetic vitamin A, of course, is in pharmaceuticals, which account for 60 to 70 trillion units out of an estimated total demand of 100 to 130 trillion units a year. Principal other uses are in foodstuffs and feeds. Vitamin A fortifies milk and margarine. However, the present law requires that margarine be fortified with vitamin A from natural sources. Producers of the synthetic will soon penetrate the food market, leaving, at least for a time, the feed market to the processors who get their vitamin A from fish liver oils.

FISH LIVER OIL BUSINESS

There are perhaps 10 to 20 producers of natural vitamin A, with about a dozen principal companies. Until now, most vitamin A has come from the livers of cod, halibut and shark. Fishing fleets from both coasts of the U. S. and those of Canada, Newfoundland, Iceland, Norway, the Union of South Africa and Japan have profited from this business.

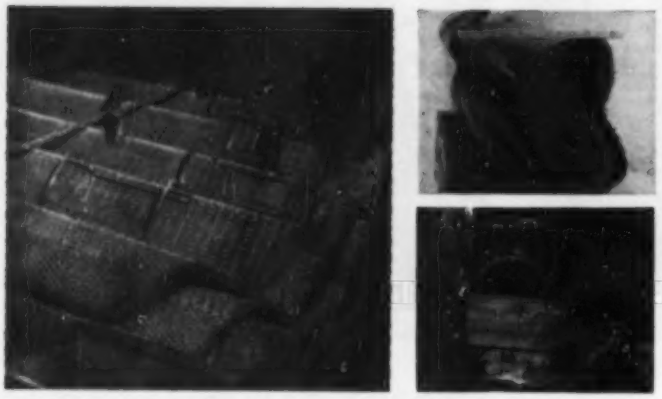
When World War II shut off imports of fish liver oils, the U. S. shark-liver business boomed. The West Coast fleet grew to more than 500 vessels; shark livers rose from 18.6 c. a lb. in 1937 to $6 and $7 in 1944, reached an all-time high of $19.75. One boat brought in a record catch worth $7,138. Almost overnight, shark fishing grew from a $500,000 to an $8-million-a-year business.

SYNTHETIC ENTERS COMPETITION

Since war's end, West Coast shark fishermen have been heading into troubled waters. Manufacturers of synthetic vitamin A have begun a determined penetration of the market; cod liver oil has come back in quantity; and now the Japanese are back in business. With U. S. drug and food producers expected to take an estimated 110 trillion units this year, the Japanese are ready to dump 35 trillion units of vitamin A from fish liver oils into the U. S. A drive to raise the duty on Japanese imports, now 5 percent, is becalmed. Men of the West Coast fleet, now down to 100 boats, are battling cod fishermen for the dwindling vitamin A market left to the fish liver oils. Meantime, companies like DPI, Pfizer, Merck and Hoffmann-La Roche are ready to market upwards of 60 trillion units of high-potency low-cost synthetic vitamin A.

Process Equipment News

THEODORE R. OLIVE, Senior Associate Editor



View at left shows trays of Panapak packing as they appear when installed in a tower. Upper right view shows how packing can be rolled up before insertion through the manhole, the lower right view showing a rolled up tray actually being inserted.

New Tower Packing of Metal Lath Outdoes Conventional Packing Materials

Pan American's development for use in distilling columns and other packed towers now licensed non-exclusively

(148a) Performance that is much superior to that of bubble cap trays, as well as other conventional types of tower packings, is claimed for a new type of packing, Panapak, which has been developed by Pan American Refining Corp. at its research division in Texas City, Texas. The invention of R. C. Scofield, Panapak is now being made available to industry under non-exclusive license arrangements direct with the potential users. The Marshall-Moorman Development Co., of New York, has been appointed technical and licensing agent for the new packing. Suitable for various sorts of contacting operations between liquid and gaseous phases, and probably also for liquid-liquid extraction as well, Panapak is made from expanded metal lath which is available as a regular article of commerce in carbon and stainless steels.

Fabrication of the finished packing from the lath is a fairly simple matter. The arrangement known as No. 7 Series packing, for example, is made by forming seven layers of ¾-in. diamond metal lath into a series of ridges and valleys by pressing over a wooden form in a standard press. This operation produces a serrated mat or layer of packing. After forming a series of mats in this fashion, and cutting them to conform to the tower diameter the packing is ready for assembly.

Assembly is accomplished within the tower for larger installations, while in smaller ones, the packing is made up in the fonn of a cartridge for insertion through the tower top. In larger installations individual mats may be rolled up and inserted through a man-way as the illustrations show. The mats are bolted or clipped together to form a vertical assembly. A cross section of well assembled packing shows a series of perfect squares, one diagonal being vertical. Asbestos fiber or some similar material is used to seal the packing against the tower wall.

A comprehensive experimental program with the new packing has been undertaken by Pan American. Three commercial installations are now in existence, one having been in operation for almost two years. Results of these commercial installations are stated to agree with the experimental data previously obtained. It has been shown, for example, that distribution of liquid and vapor are excellent, without apparent effect due to tower diameter. The packing has an extremely high capacity, ranging from 150 to over 200 percent of the allowable vapor velocity for bubble cap towers, depending on the liquid downflow rate. The height equivalent to a theoretical tray ranges from about 30 in. at minimum recommended operating rate, to 12 in. at optimum operating rate. This optimum rate is defined as the initial flood point.

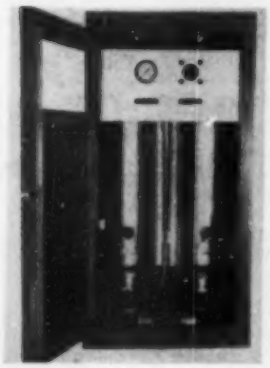
Compared to conventional types of tower packing, the No. 7 Series packing shows a 4.5 to 1 capacity advantage over ½ in. raschig rings and a 2.5 to 1 capacity advantage over 1 in. raschig rings. Since the packing can be preformed to widely varying densities and dimensions, it can be "tailor-made" to suit specific problems. Despite the large amount of experimental work already accomplished, much still remains to be done. Experimental data for high vacuum and for liquid-liquid contacting are not at present available, but a test program is being planned and it is anticipated that the new packing will prove extremely useful in these fields.—*The Marshall-Moorman Development Co., 74 Trinity Place, New York 6, N. Y.*

FOR INDUSTRIAL USE:

Color Television

(148b) Developed especially for industrial use, for example, to assist in the control of dangerous operations, is a color television system announced by Allen B. Du Mont Laboratories. The new system operates over a cable up to 1,000 ft. long between camera and picture equipment. Because it need not conform with FCC band width specifications, it is able to give picture resolution which is much superior to that in commercial color television broadcasting. Commercial systems, for example, permit a band width for the picture of only 4.5 megacycles, whereas the new system uses a band width of 18 mega-

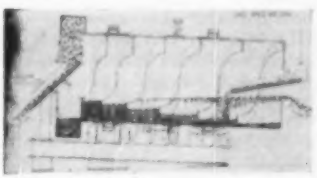
cycles, thereby permitting resolution at least as good as in conventional black and white television. The new system permits visual control of both inaccessible and dangerous operations in such fields as high pressure experimental work, rocket propulsion and, presumably, nuclear engineering.—*Allen B. Du Mont Laboratories, Inc., Television Transmitter Division, Clifton, N. J.*



FOR INSTRUMENT AIR:

Automatic Dehumidifier

(149a) The Model 50 EIAC, a new completely automatic dehumidifier for instrument air supplies, developed by Industrol Corp., is capable of drying 50 SCFM. of air at 100 psig. and 70 deg. F. to a maximum dew point of minus 40 deg. F. A model half this size is also available. Use of this equipment is claimed to reduce maintenance on instruments by eliminating condensation in the air lines and preventing the possibility of such lines freezing in out-of-doors locations. The unit operates from a standard a.c. lighting circuit and is said to require no attention in operation. *Industrol Corp., 88–35 76th Ave., Glendale, Brooklyn 27, N. Y.*



LOW-MAINTENANCE:

Heavy Media Separator

(149b) Already being used in the heavy-media separation process for iron ore in the Mesabi iron range, a new heavy-media separator for the beneficiation of various non-metallic and metallic ores has been introduced by Hardinge. The separator is an adaptation of this company's rotary classifier. It consists in a slowly revolving inclined cylindrical drum containing spiral flights on the inner surface. The material to be separated, accompanied by the heavy sink-float medium (a heavy mineral suspension in liquid) is fed into the lower end. Rotation of the drum carries the "sink" to the high end, where it discharges, while the "float" overflows at the lower end.

This arrangement has no internal moving parts, which is said to minimize maintenance. Other advantages include the small quantity of media required to fill the circuit, the ability to handle large pieces of ore, up to 4 in., and the fact that the unit starts up easily after several hours shut-down. —*The Hardinge Co., 240 Arch St., York, Pa.*

THREE TIMES STRONGER:

Aluminum Electrode

(149c) Designated as Eutectrode 2101 is a new aluminum electrode introduced by Eutectic Welding Alloys. The new electrode is said to have a tensile strength of 34,000 psi., over three times that of conventional rods for the purpose. It is said to handle almost as easily as mild steel, to give no spatter, to require as much as 30 percent less amperage than conventional rods and to deposit rapidly and smoothly. — *Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y.*

Marshall and Stevens Indexes of Comparative Equipment Costs

(1926 = 100)

Compiled quarterly for March, June, September and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering**, Nov. 1947, pp. 124–6. For a listing of annual averages since 1913 see **Chemical Engineering**, Feb. 1950, p. 123.

Industry	Mar. 1949	Dec. 1949	Mar. 1950
Average of all.....	165.1	159.4	160.0
Process Industries			
Cement mfg.	159.5	155.3	155.5
Chemical	167.5	163.3	163.5
Clay products	154.5	150.3	150.6
Glass mfg.	157.6	153.4	153.6
Paint mfg.	160.5	156.6	156.8
Paper mfg.	161.1	156.9	157.1
Petroleum ind.	163.9	159.7	159.9
Rubber ind.	166.3	162.1	162.3
Process ind. avg...	164.9	160.7	160.9
Related Industries			
Elec. power equip..	169.1	164.9	165.1
Mining, milling	168.2	164.0	164.2
Refrigerating	181.2	173.6	174.8
Steam power	156.2	152.0	152.2

LOW CURRENT:

Double Solenoid Valve

(149d) For the control of air or low pressure hydraulic service, C. B. Hunt & Son has developed its new type DS line of double solenoid control valves. These valves have two small solenoids traveling through only ¼ in. stroke to move a small pilot valve plunger and supply air to the operating piston, thus moving the

(Continued)

More Information . . .

To find out more about any of these pieces of new equipment, circle the item's number on the Reader Service Postcard—page 11.

This Month . . .

As we write this, it is the first day of spring! It's snowing merrily and every so often the snow stops and it rains—hard. Wonder how a rainmaker must feel, sitting on a snowy peak in the Catskills and wishing Nature would stop her frustrating precipitation so he could give his own art a whirl. In a way, there is a parallel for editors. It never rains but it pours! Right now receipts of new equipment news are running at more than five times our best possible rate of consumption. Which means we must become ever more choosy. And what have we chosen for now? Well, p. 150 will introduce you to an absolutely new idea in dust collectors. On p. 152 there is an electronic remote tank gaging set-up that looks like a honey. The mechanically minded will get a bang from the adjustable cam on the flow control valve on p. 154, while the pressure feeder on p. 156 is going to answer a lot of prayers.

Next Month . . .

Not to give away the whole show, but just to mention a few of next month's headliners, there's a filter with a brand new filter medium—stainless steel springs! Another is a combined hydraulic and mechanical classifier that improves on anything formerly available. Still another is a pump of a new construction material combining properties of carbon and plastics.

main valve plunger back and forth. The arrangement means reduced amperage requirements and high speed operation at normal pressures. Intermediate relays are unnecessary, thus simplifying the electrical control circuit. Low inertia of the solenoid pilot valve avoids destructive impacts and reduces the possibility of solenoid trouble resulting from voltage variations. These valves are produced in sizes from ¼ to 2 in. in two-way, three-way and four-way designs.—*C. B. Hunt & Son, Inc., Salem, Ohio.*

NEW PRINCIPLE:

Dust Collector

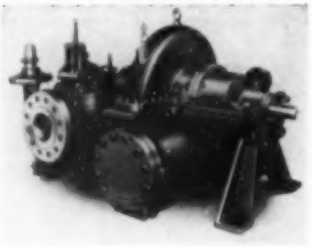
(150a) A new type of dust collector which uses inertia forces for separation, but does not accomplish this centrifugally, has been put in the market by Aerodyne Atlantic Corp. Known as the Aerodyne collector, the new unit employs conical collection units or "filters" formed from a louvered sheet rolled into a cone. The numerous louvers are bent outward in such a way that when dust-laden air enters from the large end of the cone and exits through the louvers, its flow is directed back, outside the cone, in a direction roughly parallel with the entering stream. In the case of large particles, the separation is effected mechanically. In the case of very small particles the aerodynamic forces predominate over the inertial forces and the particles follow the gas in motion.

Between these extremes, in the range of sizes of dust and grit, the aerodynamic and inertial forces are of the same order of magnitude and enter into a reciprocal action causing the particles to glide through wave-like stream layers just above the filter surface. Meanwhile, clean air escapes through the louvers. The combination of forces tends to act away from the louvers so as to keep the dust particles suspended as a thin cloud layer immediately in front of the filter surface. Thus, although the louvers are vastly larger than the dust particles, the bulk of the dust loading is removed and even adhesive dusts are said to show little tendency to clog the filter.

The dust layer and larger particles pass at high speed to the apex of the filter where they are continuously withdrawn into a secondary circuit together with a small percentage of the air or gas. The concentrated dust mixture in the secondary circuit passes through a small collector for recovery or disposal. The secondary air or gas then returns to the primary inlet for recycling through the system.

This describes a single-stage unit. The unit illustrated is a two-stage type in which both the primary air and secondary air from the first stage pass through a second filter unit. Both units discharge, however, to the same small collector for recovery or disposal of the dust. In exceptional cases a third stage may be added. On the other hand, several filter cones may also be placed in parallel for larger capacity.

As in the case with other collectors using inertial forces, actual collection efficiency depends on many variables in addition to particle size and shape. In general, however, it is claimed that the efficiency is high in comparison with usual collection methods and that furthermore, it is practically independent of equipment size. Other advantages claimed include low resistance and correspondingly low power consumption, high capacity, self-cleaning filter surface and almost complete absence of erosion—*Aerodyne Atlantic Corp., 44 Wall St., New York 5, N. Y.*



HIGH PRESSURE:

Single-Stage Turbine

(150b) A mechanical drive turbine, said to be the first standard model of single-stage machine designed especially for high pressure service, has been announced by De-Laval. Initial pressures to 1,450 psig., initial temperatures to 950 deg. F. total temperature, and back pressures to 300 psig. are claimed. Known as Model CP, the turbine is sealed entirely with labyrinth shaft seals, said to prevent leakage effectively, reduce losses and require less maintenance. Made in three sizes up to 2,000 hp., the turbine can be furnished with any of eight different types of governor.—*DeLaval Steam Turbine Co., Trenton 2, N. J.*

READILY CLEANABLE:

Heavy Duty Valve

(150c) Designed primarily for handling slurries or gases containing a high percentage of solid particles, a new heavy-duty valve for line pressures to 100 psi. has been developed by Rockwell. This valve, the Kwikleen, is provided with a cover plate at the bottom of the sediment chamber which is readily swung out of place for cleaning. A high-pressure air, steam or water line, attached to a plug hole in the bonnet, thoroughly cleans the entire valve. Valve bodies are of cast iron, with a steel blade. However, a bronze body with brass or stainless steel blade can be supplied. The blade is not of the wedge type, but close tolerances are said to reduce leakage to a minimum. Available sizes range from 4 to 24 in.—*W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn.*

RUGGED, LONGE LIVED:

Hammer Mill

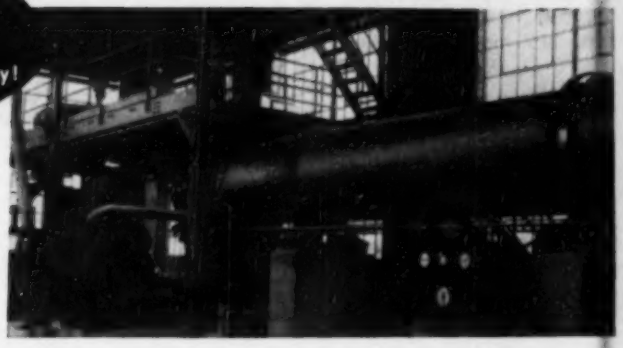
(150d) Claimed to be of exceptionally rugged construction, the new HD hammer mill introduced by Sprout-Waldron is built of heavy cast iron but is arranged compactly for installation in a 5x6-ft. floor space. Uniform feeding is provided by a crusher-feeder. An access door is supplied for ready removal of the screen or for adjustment of the hammers. The hammers are of four-point reversible type, of special alloy steel. Screen support is such as to eliminate blank areas. Screens can be reversed when they have become worn. After this they can be rerolled by the manufac-

(Continued)

See Louisville for
CREATIVE
DRYING
ENGINEERING

New Louisville Chemicals Dryer costs less, does 50% more work . . . at 77% less operating expense

KNOW THE RESULTS Before You Buy!



FORMER DRYER

Installed cost	$40,000
Annual production (tons)	6,000
Drying cost per ton	3.72

(space required, 1500 sq. ft.)

LOUISVILLE DRYER

Installed cost	$20,000
Annual production (tons)	9,000
Drying cost per ton	0.83

(space required, 500 sq. ft.)

YEARLY SAVINGS of LOUISVILLE DRYER in OPERATING COSTS ALONE $14,850

Other General American Equipment:
Turbo-Mixers, Evaporators, Thickeners, Dewaterers, Towers, Tanks, Bins, Filters, Kilns, Pressure Vessels

A magician's creation? No! The Louisville Dryer described here was installed by a chemical processor after his production was completely analyzed by a Louisville engineer. By using advanced, complete knowledge of drying processes, this dryer was especially designed to fit into his production line after the dryer's performance was pre-determined in our own unique research laboratories and pilot plant.

Without obligation ask a Louisville engineer to survey your drying methods. He may come up with a better solution that costs you less for faster, more satisfactory production.

Louisville Drying Machinery Unit
Over 50 years of creative drying engineering
GENERAL AMERICAN TRANSPORTATION CORPORATION
Dryer Sales Office: Hoffman Bldg., 139 So. Fourth Street Louisville 2, Kentucky
General Offices: 135 South La Salle Street, Chicago 90, Illinois
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Shaft Packing No Chemical Can Attack

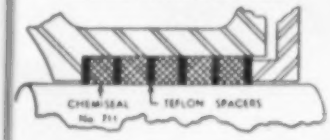
Teflon "Chemiseal" #711 Packing Stays in Service Months Where Other Packings Failed in Hours

"We've got a pump handling hypochlorites," a paper manufacturer told us, "and we can't find a packing that will last more than 5 hours." So we sent him a set of Chemiseal #711. It went into continuous service in November. It's still in there and going strong months later.

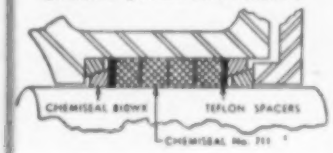
A steel plant tried a #711 packing last summer on a pump handling coke liquor. Recently they ordered #711 for 40 more pumps.

There are hundreds of similar cases in our files.

CHEMISEAL #711 SHAFT PACKING



CHEMISEAL #711WX SHAFT PACKING



No chemical — acid, solvent, caustic, oil or gas — can attack or dissolve a Teflon Chemiseal #711 or #711WX packing. "Chemiseal" non-corroding, non-contaminating, heat-resisting gaskets, packings, adapters and expansion joints can save you hundreds of dollars and countless production delays.

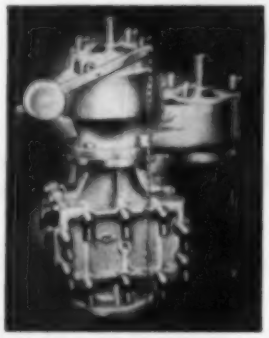
Phone, write or bring your gasket and packing problems to —

UNITED STATES GASKET CO.

628 N. 10th Street

Camden, New Jersey

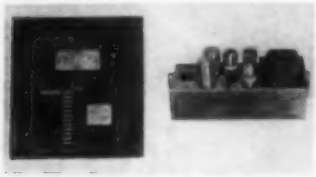
turer for use on the other side. Hammers are of a special three-ply construction with a softer center which wears away faster than the hardened outer layers, always leaving two self-sharpened corners.—*Sprout, Waldron & Co., Muncy, Pa.*



INCREASES FLOW:

Vent Valve

(152a) Development of a new series of conservation vent valves designated as the Fig. No. 5800 Series, has been announced by the Vapor Recovery Systems Co. These valves, designed for the venting of flammable vapors from storage tanks, consist of this company's new Fig. No. 2000 vent valve, combined with a suitable flame arrestor. The valves are claimed to have the unusual property of actually increasing the flow as compared with the theoretically possible flow through an open nipple of the same diameter. This is accomplished by designing the valve as if it were a venturi diffuser, while the tank nipple itself serves as the venturi throat. In addition, valve disks and seats are specially designed for high flow. The new unit, available also without the flame arrestor, is made in aluminum or in special construction materials to meet corrosion problems. It is produced in a complete range of sizes from 2 to 12 in., each valve being equipped with an additional inward operating valve for vacuum protection.—*The Vapor Recovery Systems Co., Compton, Calif.*



REMOTE-READING:

Tank Gaging System

(152c) To supplement its Selsyn remote-reading tank gaging system, Shand & Jurs Co. is now offering a new electronic precision remote tank gaging system incorporating a Continuous-Balance electronic indicator produced by the Brown Instrument Co. This indicator utilizes the balanced wheatstone bridge principle in conjunction with potentiometers, making use of a simple electronic system which operates only when there is a change in emf. The system operates on 110 volts a.c., reduced to 6.3 volts for energizing the measuring circuit, thus permitting the use of small-gage wire. Only four leads are required from each tank to be gaged.

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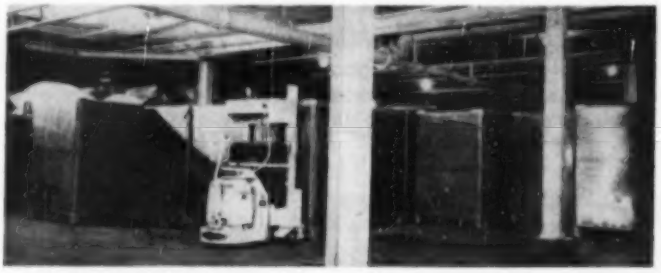

BULK HANDLING SYSTEM

(152b) Developed by Tote Systems, Inc., is a new bulk handling system for chemicals and other industrial materials which makes use of comparatively light aluminum containers of rectangular shape. In a typical size, the container capacity is 74 cu. ft. and the weight empty, 225 lb. Loaded, such a bin carries from 3,000 to 4,000 lb. Each bin is provided with a 9-in. filling opening in the top, a hatch in the side near the bottom for discharging, and legs which permit handling with lift trucks. Special tipping and discharge mechanisms are available, engineered to particular requirements. These bins are shipped either by rail or truck and are said to avoid losses, contamination and deterioration of dry chemicals.—Tote System, Inc., 700 South 7th St., Beatrice, Neb.

COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared by Bridgeport Brass Company "Bridgeport" *Headquarters for BRASS, BRONZE, and COPPER*

Extending Condenser Tube Life By Reducing Fouling

Experience has shown that the life of condenser and heat exchanger tubing is often shortened because of localized attack brought about by foreign matter lodging within the tubes or deposited on the surface of the tube sheet or the tubes themselves.

Much can be done, as a preventive measure, by using screens and strainers to keep foreign matter from condensers, heat exchangers and pumps but naturally screens have limitations. They cannot keep out marine growth and slime both of which may seriously injure condenser tubes. Also they cannot prevent corrosion-erosion of tubes when fine particles of sand are suspended in the water.

Operating Conditions Variable

The kinds of materials removed from the cooling water varies surprisingly from plant to plant even though separated by only a few miles. In some plants large rotating screens are in almost continuous operation. Other plants operate their rotating screens intermittently depending on seasonal runs of fish, leaves, branches, etc., brought in during and following periods of storm, high or flood water.

The kinds of debris which have been removed by screens, bars and strainers make an impressive list: fish, seaweed, grasses, leaves, branches of trees, shellfish, paper, nuts, bark of trees, stones, jelly-fish and all sorts of animal and vegetable matter.

The illustration shows impingement corrosion pitting that developed on the inside surface of an Admiralty tube. An object lodged in one side of the tube had caused turbulence. The full force of the circulating sea water was centered on this area while the opposite side was untouched because it was covered by the obstruction. Also other sections showed no appreciable deterioration. Some of the pits were so deep, however, that penetration of the tube wall had occurred in places.

Admiralty condenser tube attacked by impingement corrosion on the inside wall opposite an obstruction. The dark portion is the pitted area, the gray is a thin layer of protective film.

Alloys are available which are much more resistant than Admiralty to this type of attack—Aluminum Brass, Duronze IV (Arsenical Aluminum Bronze) and Cupro Nickel alloys. The individual merits of these alloys vary with the composition of the water.

Experimental work is in progress to ascertain the effect of high water velocities on these alloys. For low velocities in clean sea water impingement corrosion resistance of 70-30 Cupro Nickel containing ½% Iron is outstanding. Nevertheless, no alloy is invulnerable under adverse operating conditions.

Dangers From Foreign Matter

Some of the adverse effects are:

1. Blockage of condenser tubes by debris with marked reduction in heat transfer.
2. Under severe fouling conditions the unit may go "non-condensing" with loosening and leaking of condenser tubes in the tube sheets and warping of the tubes and tube sheets.
3. High back pressure due to restriction of flow by large masses of marine growth and debris damages pumps and associated piping.
4. Debris jamming of valves and/or restriction of flow through valves.
5. Inlet corrosion due to increased water velocity around the object lodged at the inlet. The amount of turbulence due to increased water velocity in the ends of open tubes also increases inlet end corrosion (impingement corrosion or erosion-corrosion) in these tubes.
6. Corrosion pitting or cracking initiated by decaying organisms and vegetation, particularly during periods of shutdown.

Maintenance Vital

Obviously the proper maintenance of screens, bars and strainers and periodic cleaning of condensers and heat exchangers are of the utmost importance to prevent fouling and excessive corrosion. The failure to do this is probably the greatest single cause of trouble in condensers and heat exchangers.

The time and expense involved in keeping screens, bars and strainers clean and in good operating condition may seem excessive yet all concerned with this matter are familiar with the kinds of trouble which have been prevented through the use of properly operating equipment.

Installations along the sea coasts require much ingenuity in the design of rotating screens and care in the selection of materials of construction in order to keep operating difficulties due to wear and salt water corrosion at a minimum. Due to the difficulty in anticipating the load of debris which may be encountered, it is hard to estimate the capacity of such equipment. The size of openings in screens should be small enough to stop all debris which cannot pass through the condenser tubes.

BRIDGEPORT BRASS

BRIDGEPORT BRASS COMPANY, BRIDGEPORT 2, CONN. • *ESTABLISHED 1865*

Mills at Bridgeport, Connecticut, and Indianapolis, Indiana • In Canada: Noranda Copper and Brass Limited, Montreal

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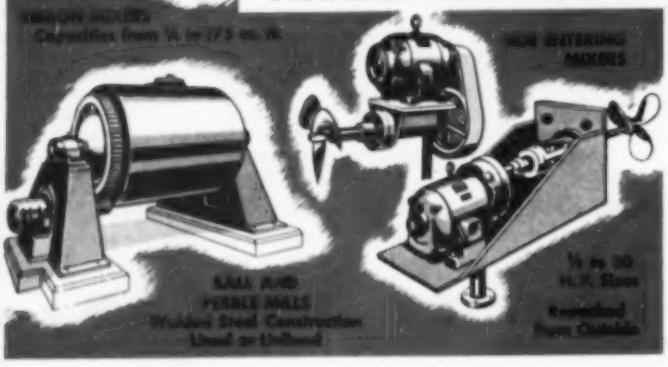
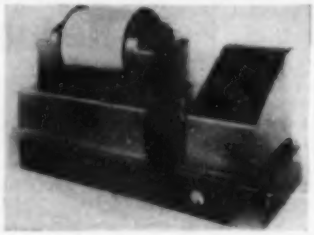


each transmitter being directly connected to the receiver without field relays or junction boxes. The new electronic gaging system is adaptable for use with any of the standard automatic tank gages for either high or low pressure storage tanks made by this manufacturer.—*Shand & Jurs Co., Berkeley, Calif.*



COVERS WIDER RANGE:

Spectrophotometer

(154a) To permit covering a wider range of operating variables then earlier commercial models, Perkins-Elmer has introduced a new double-beam infrared spectrophotometer known as Model 21. The instrument records directly in percent transmission against a linear wavelength scale on large, easily read charts. The versatility of the instrument is such, it is said, that it serves for practically every application of infrared spectrometry. Its resolution is up to the limitations imposed by the Raleigh criterion and Johnson noise. Its scanning speed ranges from 3 min. to 100 hr. for the rock salt region. Its overall range is from less than 2 microns to 15 microns in the rock salt region. —*The Perkin-Elmer Corp., Glenbrook, Conn.*

ADJUSTABLE CAM OPERATION:

Flow Control Valve

(154b) Designated as No. 235, a new adjustable-lift-opening lever-operated control valve has been developed by the Atlas Valve Co. The novel feature of this valve is that its stem is moved by an adjustable cam made to rotate by the linear movements of an operating lever. The cam consists of a flexible cam sheet backed up by a number of screws. By adjusting the screws individually, the cam sheet can be made to take any shape within fairly wide limits. Motion of the cam is then communicated to the valve stem through a roller so that the lift of the stem and disk away from the valve seat follows the curve of the cam sheet.

In this way it is possible to adjust

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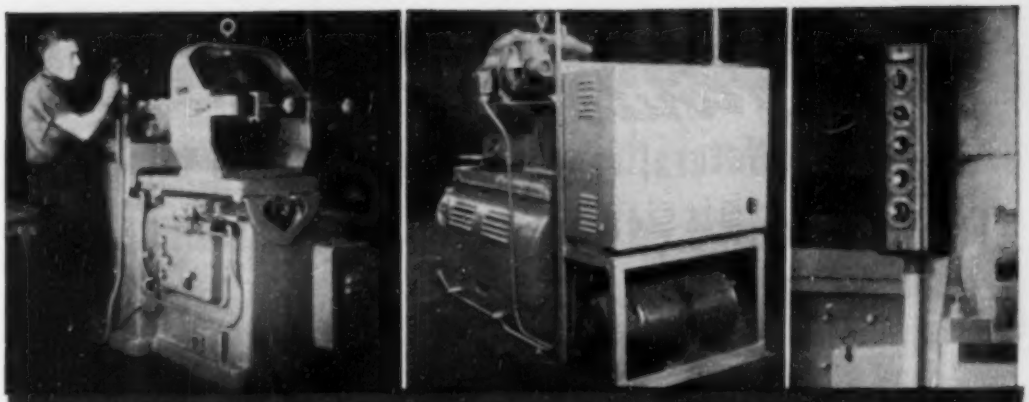


Production Has Increased
Machining Quality Is Improved
Accuracy Is Held Closer
Set-Up Time Is Reduced

Since Replacing a Conventional Motor With

Century SELECTIVE SPEED Drive

ON THIS BORING MACHINE

This is just one typical example of the time and labor saving advantages which may be incorporated in new machines — or which may be installed on equipment now in use.

Century Selective Speed Drives have been operating as long as 25 years in such places as steel mills, rubber mills, paper mills, wire mills, printing plants and machine shops. These drives are ideal wherever production processes require a wide range of stable speeds.

Ratings are available in sizes from **1 to 150 horsepower.** Speed range of 8 to 1 is standard — up to 32 to 1 is available.

The complete line of Century motors includes wide range of types and kinds from 1/6 to 400 horsepower — single phase, polyphase and direct current.

SPECIFY Century C MOTORS **ON YOUR EQUIPMENT...** or call the Century office located near you.

CENTURY ELECTRIC COMPANY 1806 Pine St. • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

Florite

Dries Natural Gas on a Transmission Line

Dehydration Plant
Tennessee Gas
Transmission
Company

AN INTERESTING use of a Floridin product is that of the Tennessee Gas Transmission Company at a compressor station on its main line at East Bernard, Tex. Twin adsorption towers filled with Florite serve alternately to dehydrate gas from local sources before it is admitted to the main line. While one tower is active, the other is being reactivated by means of a heating unit and a heat exchanger; and thus uninterrupted service is maintained. A Bureau of Mines dewpoint instrument is used for checking the efficiency of the adsorption bed.

Floridin products, adapted to a wide range of advanced modern uses, include several specially prepared forms of . . . . . .

FULLERS EARTH

as well as two grades—refining grade and desiccant grade—of Florite, which is a . . . . . .

BAUXITE-BASED ADSORBENT

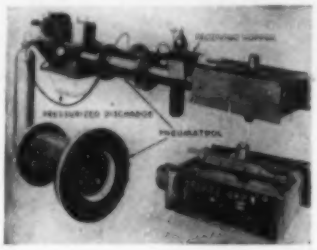
Your inquiry will be given careful attention.

FLORIDIN COMPANY

Adsorbents . . . Desiccants . . . Diluents

Dept A, 220 Liberty St., Warren, Pa.

the cam so as to get exactly the proper relation between the flow through the valve and whatever variable is used to control operation of the lever. This may, for example, be the motion of another valve so as to give ratio flow control. Among various suggested uses are the control of oil flow and air flow to a boiler, as well as the control of process streams in suitable relation to each other.—*The Atlas Valve Co., 282 South St., Newark, N. J.*



FOR FLOWABLE MATERIALS:

Pressure Feeder

(156a) To enable flowable materials to be fed continuously from atmospheric pressure into zones of either pressure or vacuum or, conversely, to permit such materials to be carried out to atmospheric pressure, Hapman Conveyors has developed a pressure feeder which operates without the use of air locks, auxiliary gates or feeders. As an example of the use to which this new feeder has been put, in one case it was used to carry filter cake continuously from a 28 in. vacuum. In another case, it was used to deliver coal to a furnace under 5 psi. pressure at 850 deg. F.

The device operates on a principle similar to that of this company's other conveyors, consisting of a chain conveyor with circular flights, passing through a pipe. These flights carry an edging of synthetic rubber. To accomplish the seal between the atmospheric receiving hopper and the pressurized discharge, they pass on both the going and return runs through Pneumatrols which are cylindrical sections of pipe containing a rubber sleeve which is brought into close contact with the flights by the pressure of compressed air or water. For material temperature above the range of rubber, Silastic can be used up to 450 deg. F. Water cooled sections can be introduced above this range. As the illustration shows, a unit consists of a receiving hopper, two Pneumatrols, a pressure or vacuum receiver (at the left) and a take-up box (shown open at the lower right). The

(Continued)

SWENSON chose NICKEL...

Solid caustic soda produced continuously in Nickel equipment made by Swenson

A recently developed Swenson evaporator produces solid caustic soda *in a single pass*, using 50% or 72% chlorate-free feed liquor.

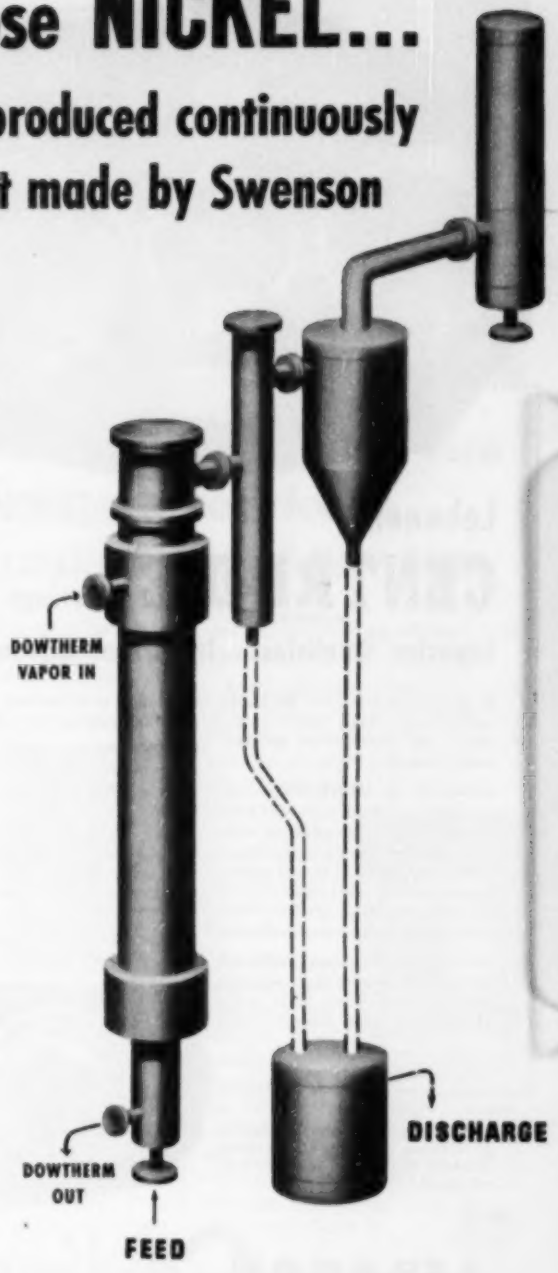
Heating is by Dowtherm vapor. The equipment is compact and low in cost. Results already obtained suggest savings up to $2.50 per ton of NaOH.

To keep metallic pick-up at a negligible minimum, all contact surfaces in the new Swenson evaporator are Nickel.

Its excellent resistance to the highly corrosive hot alkali and ease of fabrication have made Nickel the *standard* metal for handling high purity caustic soda. You will find it used successfully the world over in storage and transportation equipment, pumps, filters, evaporators, and processing tanks.

If you are contemplating new installations, remember that our Corrosion Engineering Service is always ready to make recommendations on metal selection and corrosion problems.

For further information on the Swenson Evaporator write directly to: Swenson Evaporator Company, Harvey, Illinois.



EMBLEM OF SERVICE
INCO
TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

USE PURE *Nickel* WHERE PURITY COUNTS

Rings and blanks of varying diameters produced by the CENTRI-DIE process. Shown as cast and rough-machined.

Lebanon

CENTRI-DIE TRADE-MARK Castings with

Superior Qualities... Important Advantages

● Only by the Lebanon CENTRI-DIE method can certain parts—cylindrical and circular—be satisfactorily formed.

● Only by the CENTRI-DIE process can many of the new, special heat and corrosion resistant alloys—difficult to forge—be perfectly cast in permanent molds. *This one advantage has been of great importance in the production of this country's jet engines and other super-heat structures.*

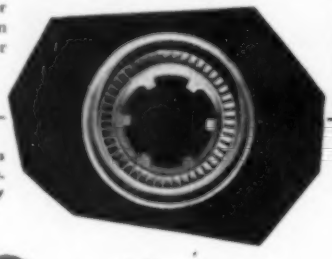
● Only by the Lebanon CENTRI-DIE method do you get these superior physical properties: finer grain structure, greater density, easier machining, more uniform strength and directional properties.

● All CENTRI-DIE castings can be made to meet A.I.S.I., A.S.T.M., A.M.S. Army and Navy Specifications.

You will want to have all the facts on Lebanon CENTRI-DIE Castings . . . we invite you to write for our bulletin or bring your requirements to our engineers.

LEBANON STEEL FOUNDRY • LEBANON, PA.

"In the Lebanon Valley"



Lebanon also produces centrifugal castings in refractory molds—in any quantities. Illustration shows typical casting made by this process.

LEBANON ALLOY AND STEEL **Castings**

CIRCLE L

air cylinder shown is only for illustration. Normally the Pneumatrols would be connected to the plant compressed air or water supply—*Hapman Conveyors, Inc., 2405 West McNichols Rd., Detroit 21, Mich.*

CORROSION-RESISTANT:

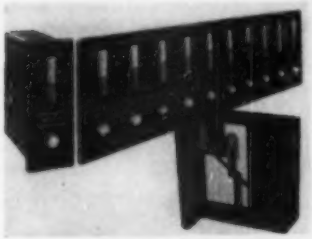
Ceramic Control Valve

(158a) For handling corrosive liquids and gases (except hydrofluoric acid and hot alkalies) at pressures to 300 psi. and temperatures to 2,000 deg. F., Emmett Machine has developed a new Merit control valve with a newly developed ceramic body. The new ceramic is said to have a hardness 0.9 that of diamond, and a tensile strength of 27,000 psi. Both body and valve stem are produced from this ceramic. Alternate hard and soft Teflon packing rings are used as seals. Valve sizes range from ½ to 3 in., and valves are attached

NEW FREEZE DRYER

(158b) Stokes is now offering a completely packaged freeze drying unit consisting of a manifold having 24 valve ports, a Freon refrigerated condenser, a high vacuum gage and a high vacuum pump with oil clarifier. The unit has a batch capacity of 3,500 ml. and a capacity of 7,500 ml. before defrosting is necessary. Designated as Model 103-FPM it occupies a floor space of 38x72 in. —F. J. Stokes Machine Co., 5900 Tabor Rd., Philadelphia 20, Pa.

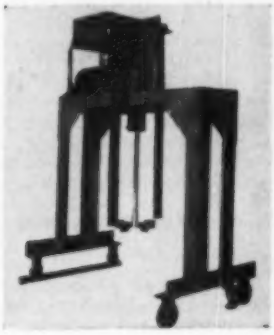
to 300 lb. standard ASA flange fittings by means of stainless steel cap screws. This concern also makes hand-operated ceramic valves. Both types may be lubricated or non-lubricated.—*Emmett Machine & Mfg. Co., 2249 14th St. S.W., Akron 14, Ohio.*



SENSITIVE, ACCURATE:

Level Indicator

(159a) Panalarm Products is offering a new line of illuminated level indicator gages which are available in from one to eight multiple units and operate from any 3 to 15 lb. pneumatic transmitter. Model 240-0 is an indicator only. Model 240-W400 employs the same indicator element, but also incorporates high and low adjustable mercury switches to operate signal lights or sound a horn. The new units visually reproduce changes in level from any source and from any remote point, showing levels on a graduated illuminated scale by means of a solid red band which depicts every dip and rise in levels. Individual units are of the "drawer type" making it easy to remove the entire mechanism for inspection.—*Panalarm Products Division, Panellit, Inc., 7218 North Clark St., Chicago 26, Ill.*



SERVES SEVERAL TANKS:

Batch Agitator

(159b) For heavy-duty liquid-agitating service where up to 40 tanks are to be served by a single unit, the Mixing Equipment Co. has developed a movable heavy-duty agitator

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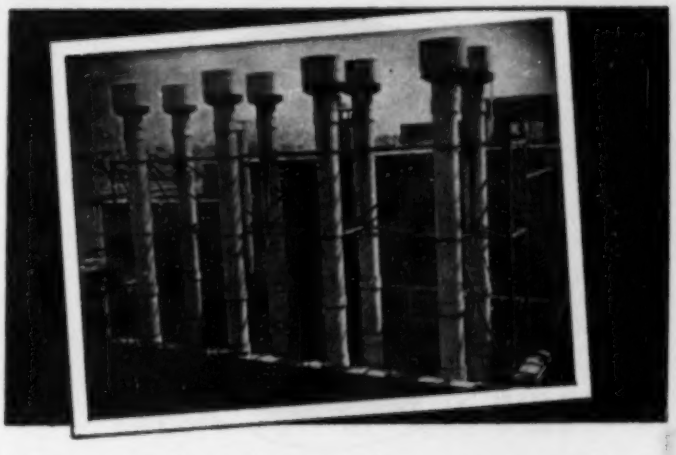


Records show long service in tough service . . .
for Transite Industrial Vent Pipe

In installations in many industries where corrosive fumes, vapors, dusts, and gases are encountered, Transite Industrial Vent Pipe is yearly demonstrating the fact that it is a practical, economical answer to tough venting problems.

Workable: Transite can be cut and drilled on the job.

Because it is an asbestos-cement product, this strong, durable pipe stands up in many types of corrosive service . . . helps avoid costly replacement . . . results in important reductions in plant maintenance.

Easily installed—Transite Industrial Vent Pipe has many practical installation advantages. It is light in weight and easily handled. It is readily worked and can be quickly cut and drilled on the job with ordinary tools.

Easily adapted—Made in a range of sizes up to 36" in diameter, Transite Industrial Vent Pipe is readily adapted to use as vents, ducts, and stacks. A full line of Transite fittings provides a venting system that is corrosion resistant throughout.

Adaptable: A complete line of Transite fittings meets most job requirements.

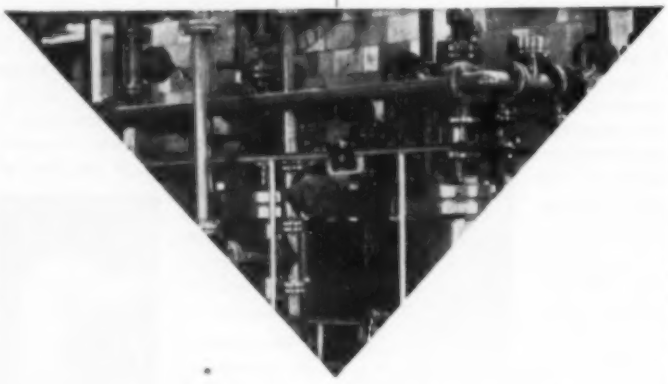
Economical to maintain—Transite is completely rustproof...highly weather resistant . . . needs no painting . . . resists corrosion outside, inside and all the way through. For full details about Transite Industrial Vent Pipe, write Johns-Manville, Box 290, New York 16, N. Y.

JM

Johns-Manville
TRANSITE Industrial Vent PIPE

SARAN
LINED
steel
pipe

cuts repairs and replacements
to a minimum!



The conveyance of corrosive liquids can prove as hard on profits as it is on equipment. It's this realization that has compelled more plants than ever before to install corrosion-resistant saran lined steel pipe. Saran's resistance to most chemicals and solvents reduces shutdowns and lost production! Saves time and labor!

Saran lined steel pipe is available in maximum lengths of 10 feet and in sizes from 1 to 6 inches inclusive. Also available are saran lined diaphragm valves, plug valves, flanges, reducing flanges, flanged fittings, gaskets and fittings with union ends.

Write us today for further information concerning saran lined steel pipe and how it may help solve your corrosion problems. Manufactured by The Dow Chemical Company, Bay City, Michigan, distributed by Saran Lined Pipe Company, Dept. TSP-18.

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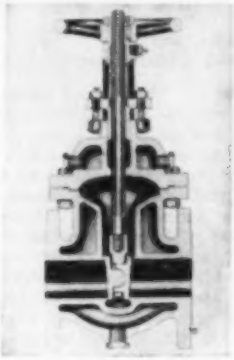
SARAN LINED PIPE
DOW
product

mounted on castors for rolling on a track from tank to tank. The agitator is of the turbine type and is raised and lowered by hydraulic means. To switch from one tank to another the operator merely sets two levers, releases a floor lock and wheels the unit to its new position. Originally developed for paint tinting, where tests have indicated that the new agitator cuts mixing time to one-sixth or one-eighth of that formerly required, the unit is offered also for other similar processes using a number of tanks.—*Mixing Equipment Co., 1024 Garson Ave., Rochester 9, N. Y.*



COMPLETE COVERAGE:

Jacketed Valve

(160a) Among its new jacketed valves, produced in Types 304 and 316 stainless and other alloys, Alloy Steel Products Co. has produced a design in which both body and bonnet are fully jacketed. Jackets extend to the edge of the flanges on the body and include the stuffing box area on the bonnet. In the No. 1105 type gate valve, the design provides for a fully rotating ball-and-socket split-wedge disk assembly. A rising stem and stationary hand wheel are employed. In the No. 1305 globe valve, a special modified plug disk is used with rising stem and rising hand-wheel construction. The line also includes the No. 1505 jacketed check valve.

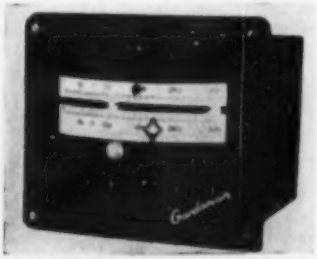
These valves are produced in sizes from 1 to 4 in.—*Alloy Steel Products Co., Linden, N. J.*

STRONGER, MORE EXACT:

Glass Pipe

(160b) Known as Pyrex brand double-tough glass pipe, a new type of glass pipe for industrial use has recently been introduced by Corning Glass Works. Although the new prod-

uct is claimed to be interchangeable with the quality of glass pipe formerly shipped, retaining all the advantages of the present pipe, it is said to be stronger and to have a 50 percent closer tolerance on length, flatness, angularity and bow. Despite the improvements, the new pipe will be available at no increase in cost.—*Corning Glass Works, Corning, N. Y.*

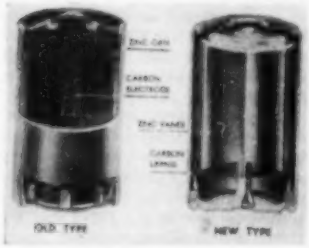


ELECTRONIC PRINCIPLE:

Temperature Controller

(161a) Under the name of Gardsman (Model J), Taco West Corp. has introduced a new temperature controller which operates on electronic principles, but uses no filament type tube thus, it is claimed, insuring long and uninterrupted service. The absence of tubes also is used to mean that there is no starting delay for warm-up time. The sensitive element for the instrument is a thermocouple. The temperature is indicated by a pointer, but there is no physical contact between the control circuit relay system and the movement. Al-

(Continued)



FLASHLIGHT BATTERY

(161b) National Carbon has introduced a new industrial battery, Eveready No. 1050, which is "inside out," compared with conventional batteries. The outside is now carbon, with a zinc power vane as the center element. The new battery, therefore, is said never to perforate, nor will it swell, stick or jam in the flashlight. Furthermore, it is said to give double the usable light produced by earlier batteries.—National Carbon Division, Union Carbide & Carbon Corp., 30 East 42d St., New York 17, N. Y.

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though designed primarily for the control of industrial furnace temperatures, the instrument is said to be equally effective for other industrial temperature control problems. The same instrument is also adapted to modification for program controlling of temperature as well as for other control functions such as fluid flow, liquid level and viscosity.—*Taco West Corp., 525 North Noble St., Chicago 22, Ill.*

CONTINUOUS RECORD:

Viscosity Recorder

(162a) Jointly announced by Brookfield Engineering Laboratories and Brown Instruments Division is a new continuous indicating and recording viscosity instrument known as the Viscomat. The instrument is said to be capable of indicating and recording viscosity changes as small as one-half of 1 percent of scale, and of handling viscosity from a minimum of 20 centipoises to a maximum of 100,000 centerpoises. It can be used in measurements on both Newtonian and non-Newtonian liquids. The viscosity head is manufactured by the Brookfield organization, and the recording equipment by Brown.

The recording equipment includes a mercury-filled temperature indicating system transmitting pneumatically to the recorder. The viscosity sensitive device employed in the Viscomat is similar to that in the Brookfield Viscotrol described on page 136 of our January 1950 issue. However, the instrument uses a new method of measuring the torque produced in the calibrated spring, and in transmitting this measurment. A microtorque potentiometer is built into the spindle drive system in such a way as to measure with high accuracy the angular displacement between drive and spindle produced by viscous drag. This quantity is converted into an electrical impulse which is transmitted by a six-wire cable to the electronic recorder.—*Brown Instruments Division, Philadelphia 44, Pa., or Brookfield Engineering Laboratories, Stoughton, Mass.*

Plastic Pipe

(163a) Carter Products Corp. has announced another plastic pipe formulation known as Carlton T, which features especially high tensile and structural strength. Produced in sizes from ¼ to 2 in., the bursting strength varies with size from 840 to 550 psi. The new pipe is quickly installed using special cemented joints and is said to be resistant to a wide variety of corrosive agents.—*Carter Products Corp., 10187 Mcech Ave., Cleveland 5, Ohio.*

Electric Heater

(163b) Developed initially for heating CO_2 discharged from pressure bottles, the McIlrath heater is now being offered for quick transfer of heat to any small flow of liquid or gas which is not corrosive to copper tubing. The unit operates on 110 or 220 volts a.c. and is produced in two sizes, one for 1,000 and the other for 2,000 Btu. per hr. It consists of 12½ ft. of ⅛ in. copper tubing coiled and cast into an aluminum block with thermostatically controlled electric heating elements.—*Roy E. McIlrath, 8849 South Laflin St., Chicago 20, Ill.*

Spectro Computer

(163c) Phillips Petroleum has developed and is now offering its 66 Spectro Computer which solves simultaneous linear equations of the type encountered in infrared and mass spectrometry. The computer utilizes d.c. electrical potentials substituted for the unknowns in the equation and solves these equations by a method of iteration. The multiplication, division, addition and subtraction steps necessary in solving a spectroscopic analysis problem involving as many as ten simultaneous equations can normally be carried out by the instrument in 5 to 30 min.—*Phillips Petroleum Co., Special Products Division, Bartlesville, Okla.*

High Duty Belt

(163d) Known as Super-7 is a new Texrope belt of oil-resisting construction having a 40 percent higher rating than standard V-belts. This belt is offered primarily for use where space is limited but it is finding more general use since the price for a complete drive is generally less than for a standard drive. Against this advantage, however, is the expectation that covers will wear more rapidly since fewer belts are required for a particular drive.—*Allis-Chalmers Mfg. Co., Milwaukee, Wis.*

—*End*

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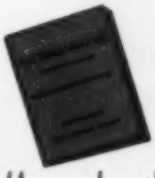

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New Products and Materials

JOSEPH A. O'CONNOR, News Editor

PRICES CUT:

Fluorocarbon Thermoplastic

(164a) More than a score of new industrial applications for Kel-F have stepped up sales and expanded production, thus permitting M. W. Kellogg Co. to reduce the original schedule of prices on its fluorocarbon thermoplastic by about 50 percent. A new scale of prices is now in effect.

For example, 100 lb. of low-density molding powder now costs $13.75 a lb., as compared with the original cost of approximately $26 a lb. for the same quantity. This reduction, according to Kellogg, resulted from the acceptance of Kel-F in so many different industries during the past year, which has greatly increased production.

Attesting to the value of the chlorine atom included in the formula, which differentiates Kel-F from similar fluorocarbons and makes the product readily moldable, the uses include those for which Kel-F has been molded by all standard methods such as injection, transfer, compression and extrusion. In addition, waxes, greases and oils are made from Kel-F polymers of low molecular weight.

Among the actual applications are Kel-F-lined hose and special, soft-pressed seal rings made from graphite and asbestos, as well as Kel-F for use as centrifugal pump shaft packing. Other applications include Kel-F-coated high-temperature radio hook-up wire, hermetically sealed transformer terminals, special gaskets, "O" and "V" rings, "U" cups and a diaphragm for special pumps.

A relative newcomer in the field of fluorocarbon plastics, Kel-F was developed during the search for corrosion-resistant materials to be used in connection with the production of U-235 at the gaseous diffusion plant in Oak Ridge. Since this initial application Kellogg has erected in Jersey City, N.J., the country's only commercial plant for its production. That plant is now operating at capacity.

Kel-F, a polymer of trifluoromonochloroethylene, has several unique properties, such as resistance to virtually every corrosive and the ability to withstand temperatures up to 390 deg. F., that make it particularly useful for many industrial applications, especially in the chemical processing field. In addition, its high dielectric strength and other electrical properties have extended its use into the manufacture of electrical and electronic devices. Some of these devices are restricted by military security.—*M. W. Kellogg Co., Chemical Manufacturing Division, P.O. Box 469, Jersey City, N.J.*

KEL-F AS GASKET MATERIAL

Among products fabricated from the high-temperature thermoplastic Kel-F, trifluoromonochloroethylene polymer, are these gaskets made by the U. S. Gasket Co. Held in the man's hands is a Kel-F-jacketed rubber gasket that combines the resiliency of rubber with resistance to virtually any corrosive. The jacket is made from extruded tubing that is "sliced" to form the required shape. From left to right are: plasticized Kel-F "O" ring made from extruded rod heat-sealed at the butt ends; compression-molded packing ring; two wedge rings, one convex and one concave; and a second jacketed gasket.—M. W. Kellogg Co., 225 Broadway, New York, N. Y.

More Information . . .

To find out more about any of these new products, circle the item's number on the Reader Service Postcard inside the front cover.

•

This Month . . .

A new type of neoprene that imparts high wet strength to paper and a process for adding it at the beater in the mill are described on p. 166 . . . Turn to p. 168 to learn about a wood sealer with an alkyd base . . . Likely chemical building block is trimethyl orthoformate, described on p. 171 . . . See p. 172 to find out how an externally lubricated polystyrene can cut molding time . . . On p. 174 there is news of an organic primer for hard-to-coat metals.

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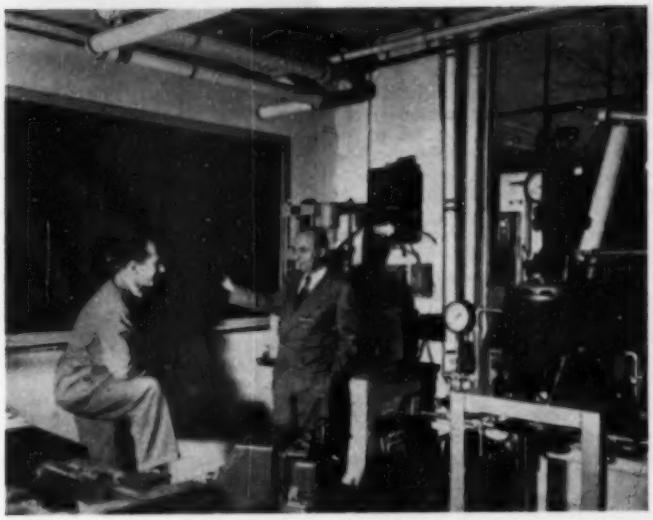
Next Month . . .

Be on the lookout for a new vat thickener for textile dyeing and a polymerized paint vehicle that has outstanding resistance to corrosion.



Skull practice in Princeton's Plastics Laboratories finds Boyd H. Carr, Jr., heeding Natcho Vasileff as he runs through reaction that produces new resins they developed.

Princeton Introduces Novel Polyurethanes Made From Castor Oil and Diisocyanate

(165a) From the Plastics Laboratories at Princeton University has come a new series of polyurethane plastics with many promising applications, chief of which so far is as potting compounds for transformers. Not only the Armed Forces, which sponsored the research, but also certain manufacturers of electrical equipment are interested in the potting compounds.

Varying from extremely hard to soft rubbery materials, these plastics exhibit good elastomeric, electrical and physical properties. They are good shock dampeners. Made by reacting castor oil with diisocyanates, these easily prepared plastics appear to be, in general, cross-linked products. They can be handled by casting methods.

Birthplace of these polyurethanes is the Plastics Laboratories at Princeton, a hotbed of research ideas, where graduate students, not a few of them mature and serious veterans who are zeroing in on carefully chosen targets for their life work, are taking advantage of a unique course in plastics engineering. Director of the laboratories is Louis F. Rahm, a genial, communicative man who likes to emphasize the free access to information found in the academic atmosphere. Obviously, he's proud of this latest achievement of two of his associates, research group leader Natcho Vasileff and one of his bright young men.

FLOOD OF ORGANIC

No sooner does Vasileff get you seated across from him at his desk in a little office at the rear of the laboratory than he reaches for a pencil, starts drawing structural formulas rapidly on the back of an envelope.

"Diisocyanates react with compounds containing poly-reactive hydrogens, compounds like diamines or glycols," he explains. "The double bond between the nitrogen and the carbon in the isocyanate group is the reactive point. There's an isocyanate group at each end of the diisocyanate, of course." He speaks with an accent. Natcho Vasileff left his native Bulgaria in 1923 to come to the United States. During World War II, he worked in the U. S. Signal Corps laboratories at Fort Monmouth, N. J.

"Take the reaction of a diisocyanate with an alcohol," he says. More structural formulas cover the back of the envelope. When he looks up, his brown eyes shine excitedly. "The active hydrogen from the alcohol hooks onto the nitrogen in the isocyanate group, so. And the rest of the alcohol attaches to the carbon. No more double bond, just a single one between the nitrogen and the carbon. It can happen at each end of the diisocyanate."

He thumbs through a fat organic book, finds a reference. "The Germans used these reactions. They turned to the polyurethanes when they were looking for materials like nylon."

Had Vasileff himself hit upon these polyurethane plastics as the potting compounds the Signal Corps needed to encase its transformers? The flood of organic chemistry is dammed. He pauses and beams. "It was Carr. Carr is one of my boys. He should be along soon."

Presently he is. Boyd H. Carr, Jr., who was born in a town that chemical enterprise helped to build, Midland, Mich., is a young research assistant working in Vasileff's group. All told, Director Rahm has five research groups at work in the laboratories.

DISCOVERY

It turns out that Carr had been looking for a binder that could be loaded with TiO_2 to yield a non-brittle, high-K, low-loss product. Polyurethanes seemed likely materials. To make one that would be more resilient and rubber-like, he had reacted castor oil with a diisocyanate. The resulting product, being resilient, tough, more or less thermoset and somewhat elastomeric, as well as easy to prepare and approximately neutral in pH, looked mighty interesting to Carr. For despite his bow-tied-and-jacketed campus casualness, Boyd Carr, with his sharp brown eyes, was quick to realize that this might be the potting compound Princeton was hunting for the Signal Corps. He did not discard the stuff. Instead, the investigation, guided by Vasileff and Rahm, took a new tack.

HOW THEY'RE MADE

Vasileff resumes his explanation. "What we do is react castor oil with a diisocyanate. Castor oil is basically a trihydroxy alcohol, and it forms cross linkages with diisocyanates. The cross linkages make the plastic material thermosetting. Actually, castor oil consists of about 80 percent of the triricinoleic ester of glycerine. But for our purposes we assume it to be 100 percent triricinolein glyceride with a molecular weight of 932. The reactive points in it are at the —OH group on the twelfth carbon atom of each ester group. We react this castor oil with TDI. That's tolylene diisocyanate, the meta compound, with a molecular weight of 174. We get it from Monsanto. How much castor oil and TDI

(Continued)

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do we use? The proportions are varied. But we use from 75 to 80 percent by weight of castor oil and 25 to 20 percent of TDI.

"The reaction is exothermic, but not vigorous. Temperature and pressure? The polymerization will go at room temperature. It takes place at atmospheric pressure. But under reduced pressure it's easier to get rid of any CO_2. The CO_2 comes from the reaction of impurities like water or free acid in the castor oil with the diisocyanate. As a catalyst, we've used about 1 percent by weight of Minnesota Mining's Sylon RD 602. That's di-tertiary butoxy diamino silane. It's a diamine, so it reacts with TDI. And it speeds up the cure."

In the wake of the initial research after Carr's discovery came many other experiments designed to explore possible structural modifications. Resins were made from castor oil, TDI and other glycols. In addition, castor oil itself was varied through partial esterification and used in forming some polyurethane resins. Improved physical and electrical properties were achieved by modifying castor oil-TDI resins with hexamethylene glycol, glycerine and especially 2-ethyl hexanediol-1,3.

PROPERTIES

Best low-loss properties are possessed by the castor oil-TDI resin modified with hexamethylene glycol. It is hard, brittle and fairly thermoplastic. The resin with the lowest loss qualities in combination with good physical properties is one made from castor oil, TDI and 2-ethyl hexanediol-1,3. It has good electrical and mechanical properties. It has good chemical resistance, withstanding caustic and mineral acids, together with fair solvent resistance, good heat resistance and a neutral pH action. Its shrinkage on gelling is negligible, and it has fairly good qualities at low temperatures.

Best potting compound of those tested was the castor oil-TDI resin modified with 2-ethyl hexanediol-1,3. Five transformers encased in it came through the tests required by Army-Navy Specification JAN-T-27 successfully. The potted transformers passed the 5-cycle test with little effect on electrical properties. No internal shearing was found, and the beakers containing the resin-encased transformers were not broken by thermal action. After the 5 cycles, the potted transformers were immersed in saturated salt water at room temperature for 66 hr. with little effect on insulation resistance.

Transformer potted in resin.

After seven weeks in an oven at 140 deg. C. one of these diisocyanate-castor oil resins modified with a little octylene glycol showed no change in electrical properties. It hardened somewhat, however, and darkened slightly. Normally, these resins are clear and yellowish. They look and feel rubbery, but they do not bounce. Despite their high compressive strength, these plastics absorb shock. They have been used to protect thermometers. Thin sheets will dampen vibrations and noises. When they are cast, they take the shape wanted and set up quickly, with little shrinkage. They stick to materials like cloth and leather.

The foregoing materials were produced in the course of contract research at Princeton sponsored by the Army, Navy and Air Force.—*Plastics Laboratories, Princeton University, 30 Charleton St., Princeton, N. J.*

MILL-TESTED:

Neoprene Additive

(166a) A new type of Du Pont neoprene, especially developed for treating paper, increases the strength and chemical resistance of the finished paper. The process for adding it to the pulp has been mill-tested.

Both the neoprene and process for its addition were developed in the Deepwater Point, N.J., laboratories of Du Pont. Five of the company's rubber researchers, R.H. Walsh, H.H. Abernathy, W.W. Pockman, J.R. Galloway and E.P. Hartsfield, reported details about both developments at the recent New York meeting of the Technical Association of the Pulp & Paper Industry.

A practical process has been developed for adding neoprene to paper at the beater. It has undergone various

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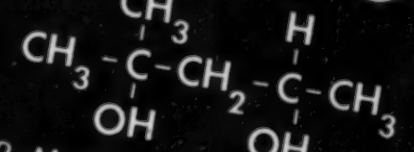
FROM SHELL CHEMICAL

HEXYLENE GLYCOL



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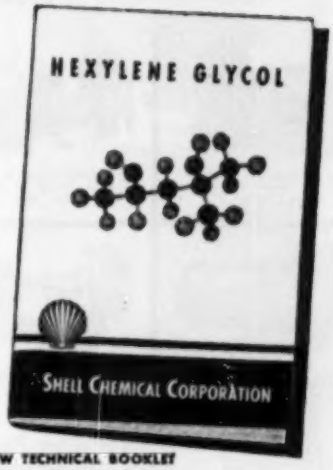

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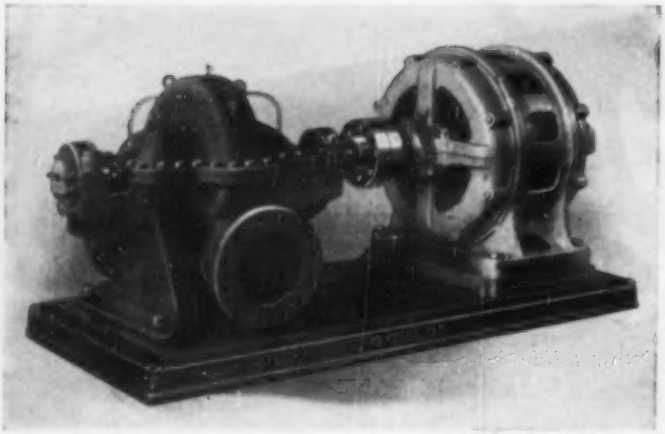

Fig. 3450

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Other Examples of Goulds Complete Line

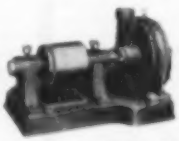

Fig. 3010—Cap. 9 to 100 G.P.M. Heads to 70 ft. Sizes 1", 1½", 2".

Fig. 3650—Cap. to 2000 G.P.M. Heads to 400 ft. Sizes 1" to 6".

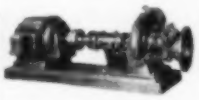

Fig. 3109—Cap. 250 to 4500 G.P.M. Heads to 220 ft. Sizes 4" to 8".

Fig. 3648—Cap. to 35 G.P.M. Pressures to 150 lbs. Sizes ¼ H.P. to 5 H.P.

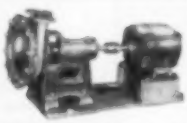

Fig. 3705—Stainless Steel—Cap. to 600 G.P.M. Heads to 200 ft. Sizes 1" to 3".

Fig. 3330—Cap. 40 to 2000 G.P.M. Heads to 5200 ft. Sizes 2" to 8".

Goulds Has The Right Pump For Your Job

The above are only six of the more than 180 types and sizes of pumps that Goulds makes. Pumps are our only business—have been for over 100 years.

The *right pump* for your job saves you money. Phone or write Pump Headquarters or your nearest Goulds representative for their recommendation on any pump job you may have.

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Seneca Falls
New York

mill trials. In most of the plant work a new type of neoprene latex was employed. The new product, known as Neoprene Latex Type 735, is a modification of standard types that is well adapted to the technique used in adding it to the pulp.

Experimental work revealed that addition of very small percentages of the new neoprene produces papers having outstanding wet strength. In recent years, various resins have been added to pulp to produce papers having high wet strength, but until now it has not been possible to produce high wet strength by beater addition of small percentages of elastomers. In addition to high wet strength, papers treated with small percentages of Neoprene Latex Type 735 possess unusually high breaking elongation, high tensile strength and good resistance to folding and to tearing.

Neoprene-treated papers also display considerable resistance to a variety of chemicals. For example, neoprene-treated papers, after immersion for 24 hr. in 5 percent solutions of hydrochloric, sulphuric, nitric, phosphoric and stearic acids, retain a considerable proportion of their original strength. Test results indicate possible use of neoprene-treated paper for many packaging applications, particularly those involving industrial chemicals and possibly citrus fruits.

It is expected that neoprene-treated paper should prove unusually resistant to impact and shock because of the combined characteristics of high breaking elongation and good tensile strength. Neoprene treatment might make it possible to use lighter weight papers for producing tough, wear and scuff resistant packages of many kinds.

Results of mill trials agree with laboratory results, indicating the commercial feasibility of the process. In view of the unique combination of properties imparted to paper by the new type of neoprene, the new process and product should be of commercial importance.—*E. I. du Pont de Nemours & Co., Inc., Wilmington, 98, Del.*

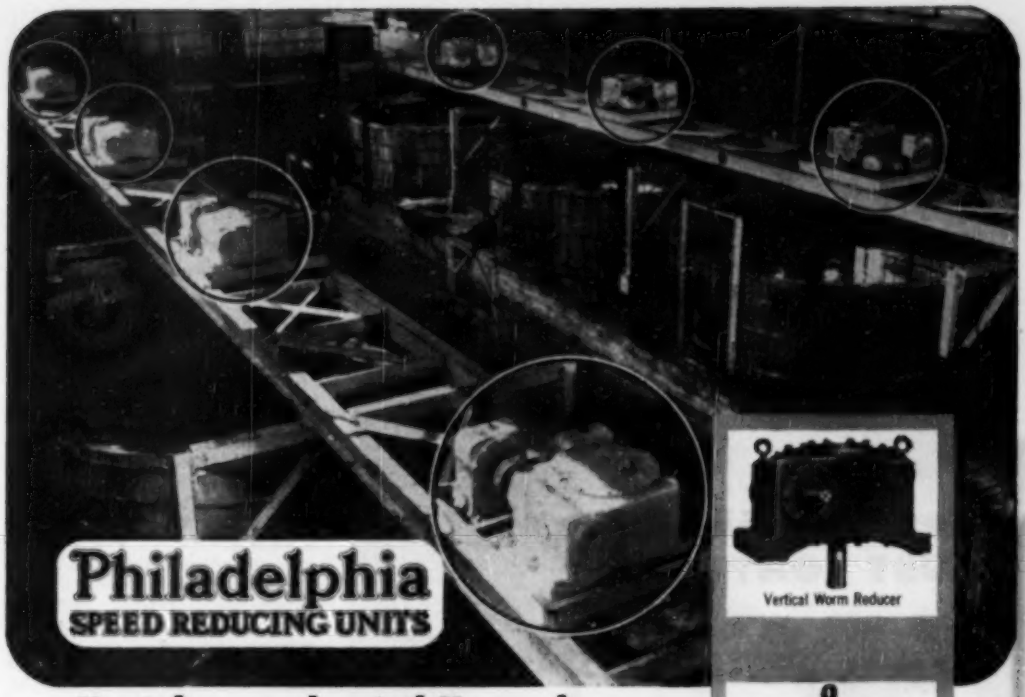
WATER-IMPERVIOUS:

Wood Sealer

(168-a) Monsanto Chemical Co. has developed a new, economical and efficient water-impervious sealer for wood. This product is the result of research at Monsanto's Merrimac Division laboratories in Everett, Mass.

It is designed as a penetrating, nonsanding, moisture-resistant undercoat for all types of lacquers, enamels and paints. Merrimac technicians recom-

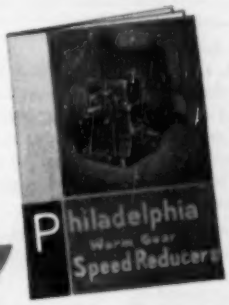
(*Continued*)



--"stick on the job"... day and night, at this Glue Plant

These 16 Philadelphia Worm Gear Speed Reducers, Types A. T. and V. T. connected together, are in continuous use at the well known glue manufacturing firm of Delany and Co., Inc., Philadelphia, Pa. The units are mounted over huge mixing vats, and the shafts of the Vertical Drive Reducers extend down into the vats and revolve very slowly. The two types of Philadelphia Worm Reducers are shown in more detail at the right.

Thousands of Philadelphia Worm Gear Reducers of all types are used throughout the world, for most every conceivable purpose in: Paper and Pulp Mills; Chemical and Process Plants; Food Plants; Steel Plants; Metal Working Industries; Sugar Refineries; Power Plants and on Shipboard.



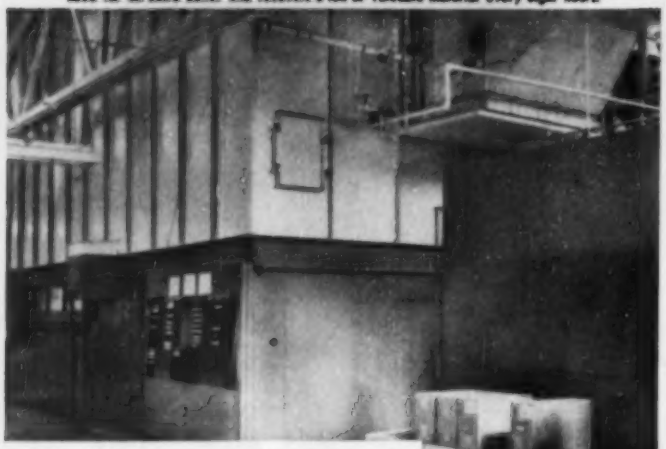
Send for copy of the Worm Reducer Catalog #26, and please use your Business Letterhead when requesting it.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON
IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

At Personal Products Corporation, this "C-J" Pangborn Dust Collector eliminates need for an extra boiler and recovers a ton of valuable material every eight hours!



How PANGBORN DUST CONTROL SAVES WINTER HEATING COSTS for Personal Products Corporation

PANGBORN Dust Control *does more* than stop dust, *does more* than recover valuable material at Personal Products Corp. The way E. W. Jochim, manager of Personal's Chicago Plant, figures ... Pangborn Dust Control saves the *cost of an additional boiler!*

Here's how:

With an ordinary system, dust laden air at the Chicago Plant would be exhausted outside. In winter, *35,000 cubic feet of precious heat a minute,* as well as dust, would be thrown away. An extra boiler for *heating alone* would be needed to make up the heat loss!

But with Pangborn Dust Control, *there is no heat loss!* In winter, heated factory air is *so clean* it can be recirculated throughout the plant. There is no need for an extra boiler ... the dust problem is solved and *a ton of valuable material recovered every eight hours!*

How much can you save?

Just like Personal Products, chances are you can *save money* in more ways than one with Pangborn Dust Control. Find out now... a free Pangborn Dust Survey costs you nothing, carries no obligation. Get the details; write for Bulletin 909A to: PANGBORN CORPORATION, 283 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the Latest Developments in Dust Control and Blast Cleaning Equipment

STOP THE DUST HOG from stealing profits with

Pangborn

DUST CONTROL

mend it for all types of wood, including plywood, which may be subject to water immersion or weathering.

The water-impervious wood sealer has an alkyd rather than a cellulose base. Proper thinners should be used in reducing the sealer. The product is expected to find a major market in brush handles, wooden bobbins for textile mills, doors and mill work.—*Monsanto Chemical Co., St. Louis 4, Mo.*

OIL-SOLUBLE:

Aromatic Amine

(170a) An alkylated aromatic amine, not previously described in the literature, is the latest chemical developed by B. F. Goodrich Chemical Co. Designated Good-rite p,p'-dioctyl diphenylamine, it is oil-soluble and has been designed for uses where a relatively colorless, oil-soluble anti-oxidant is required.

Furnished as a light buff-colored crystalline solid, it is soluble in carbon tetrachloride, ethylene dichloride, ethyl acetate, hexane, benzene, acetone and methanol.

Experimental quantities of the new amine, as well as technical data, are available.—*B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, Ohio.*

STRENGTHENS THE SOLE:

Reinforcing Resin

(170b) Production processing of shoe sole stocks promises to be substantially improved by a new rubber-reinforcing resin developed in the laboratories of the Chemical Division of Goodyear Tire & Rubber Co.

Chemically similar to Pliolite S-6 of the Goodyear chemical family, this new resin will be marketed as Pliolite S-6B.

A result of modifications in the already established S-6 material, the new resin gives greater plasticizing action at lower processing temperatures. Thus its use in shorter and more rapid mixing cycles is made possible.

Laboratory tests and factory trial runs by independent shoe sole manufacturers indicate distinct processing advantages of Pliolite S-6B and improvement in hardness and flex life of sole stocks.

This "tailored" resin for the shoe sole industry is supplied as a white granular powder, with all the physical characteristics of its forerunner, Pliolite S-6. Like Pliolite S-6, the S-6B resin may be incorporated in rubber by any of the established techniques for mixing reinforcing resins with rubber.

The new resin can be substituted

part for part in existing formulations based on Pliolite S-6 with improvements in processing and some gain in physical properties.

Products that may be benefited by the use of Pliolite S-6B in addition to shoe sole stocks are rubber flooring, wire insulation, cover stock for golf balls and inflated balls, garter buttons, gaskets, hose, wringer rolls, coated fabrics, high-impact stocks, hard rubber items and miscellaneous molded goods.—*Goodyear Tire & Rubber Co., Inc., Chemical Division, Akron 16, Ohio.*

FINE ORGANIC:

Trimethyl Orthoformate

(171a) As a logical extension of its present line of fine organic chemicals, Kay-Fries Chemicals, Inc., is now producing in limited quantities trimethyl orthoformate, a new industrial chemical building block.

The trimethyl ester, besides offering unexploited possibilities in organic synthesis, eventually might prove more economical than its homolog, triethyl orthoformate. Kay-Fries has manufactured the triethyl ester in carload quantities for a number of years as an intermediate for B-complex vitamins, anti-malarials, certain dyes and special polymers.—*Kay-Fries Chemicals, Inc., 180 Madison Ave., New York 16, N. Y.*

REPELS TICKS:

N-Butylacetanilide

(171b) Dow Chemical Co. has available semi-commercial quantities of *n*-butylacetanilide, a chemical that has been investigated by the U. S. Public Health Service and found promising as a tick repellent.

Research work was conducted by James M. Brennan of the Rocky Mountain Laboratory, Hamilton, Mont. Dr. Brennan's tests showed this material to be more effective over a longer period than any of the other materials tested.

The testing, conducted at Camp Bullis, Tex., consisted of impregnating clothing or uniforms with *n*-butylacetanilide in solution and exposing them to ticks and other insects. Effectiveness was noted daily over the time of the experiment.—*Dow Chemical Co., Midland, Mich.*

BETA-SUBSTITUTED:

Propionitriles

(171c) American Cyanamid Co. now offers four beta-substituted propionitriles in trial-lot quantities. They are beta-dimethylaminopropionitrile,

(Continued)

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PLAIN DUTCH
STRANDED TWILL
TWILL DUTCH SINGLE
TWILL DUTCH DOUBLE
ARE YOU USING THE Right METALLIC FILTER CLOTH for Your FILTRATION
If you are in doubt or would like to try another style weave, write us in detail about your filtration step. We make all five of the standard weaves mentioned above. We are in position to turn out special weaves, if necessary. And we make cloth from all malleable metals, including the noble metals.
All Newark Metallic Filter Cloth is manufactured in a wide range of meshes. It is available in rolls, cut and gasketed to fit your filter presses, or made up into filter elements. We have large stocks of standard weaves on hand to make prompt shipment.
NEWARK for ACCURACY
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Your product and process can be improved by the new chemistry of chelation. Evolved after a generation of experience in pioneering the polyamines, Bersworth now gives you exacting chemical control over cations in solution through the use of the Versenes*.

The Versenes* are extremely versatile organic chelating agents of exceptional stability. They control metallic ions with mathematical exactitude. This control may be applied to completely deactivate pro-oxidant or other troublesome ions or to give *controlled* activation for catalytic processes.

Applications include the textile, paint, soap, rubber, polish, drug, oil, cosmetic, metal refining and practically the entire chemical industry. In process industries the Versenes' control of metallic ions is of vital importance to manufacturers, formulators and users of the products of modern chemistry.

Versene*, Versene Fe-3, and Versene Fe-3 Specific were made to help you make your products and processes better. You have a stake in them. Our years of research, experience and achievement in the control of metallic ions are now yours to command.

Should you care to submit your problem, we can undoubtedly save you substantial amounts of research, time, effort and money. When the control of cations is a problem—get in touch with us at once!

*Trade Mark

BERSWORTH CHEMICAL COMPANY
Framingham, Massachusetts

Chicago Agent: Kraft Chemical Co. Inc., 917 W 18th St. Chicago—Warehouse Stocks
West Coast Agent: Griffin Chemical Co. San Francisco-Los Angeles—Warehouse Stocks

beta-isopropylaminopropionitrile, beta-methoxypropionitrile and beta-isopropoxypropionitrile.

The alkyl-amino compounds are miscible with water, while the alkoxy compounds are soluble to a lesser degree. All four nitriles are soluble in the common organic solvents.

Chemical reactivity of these nitriles has led to their potential application as intermediates for the synthesis of new plasticizers, dyes, resins and insecticides.

Technical data on the physical and chemical properties of these compounds can be secured from the producer.—*American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N.Y.*

LUBRICATED:

Polystyrene

(172a) Externally lubricated polystyrene that will cut molding time is now being produced by Koppers Co., Inc., on a full commercial scale. All three types of Koppers Polystyrene (Polystyrene 3, Polystyrene 7 and Polystyrene 8) are currently available with external lubrication and will be stocked in standard colors.

These externally lubricated formulations of Koppers Polystyrene will supplement the unlubricated types for use in special molding jobs and will be designated Koppers Polystyrene 31, 71 and 81 respectively.

Extensive molding tests by Koppers plastics engineers have indicated that the easier flow of the lubricated polystyrene in many instances will make possible a 10 to 30 percent faster molding cycle, the use of lower molding temperatures, and significantly lower molding pressures.

Low bulk factor of the lubricated polystyrene results in greater utilization of the rated cylinder capacity of the molding machine. Outstanding mold release of the lubricated polystyrene in most instances eliminates the necessity of lubricating the mold, according to Koppers engineers.

Before commercial production of the lubricated polystyrene got under way, successful field tests were conducted using intricate molds requiring a material with easier flow and mold-release properties, which had not been attainable with the unlubricated materials.

Koppers Co., Inc., Pittsburgh 19, Pa.

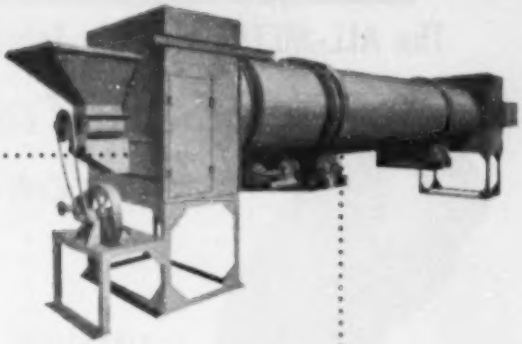
Plasticizer

(172b) Tricresyl phosphate from a dependable petroleum raw material source is now being produced by Celanese Corp of America. A top-grade

(*Continued*)

ONE OF A SERIES DEMONSTRATING APPLIED LUKENOMICS

ONE GETS YOU TWO ... or how improved kiln-drying has increased profits



Rotary drying equipment installed 12 years ago in a large eastern chemical plant proved so efficient in producing dehydrated potassium carbonate that a second rotary kiln of similar design was installed recently. These two nickel-clad steel kilns are heated to 700° F and dry the material without a trace of metallic pickup. The second installation has doubled production. Negligible maintenance and the low first cost of this efficient equipment has enabled the company to realize substantial economies in the production of a quality product.

Similar competitive advantages frequently result when Lukenomics is put to work. Lukenomics is the engineering art of solving the *total* problem posed in considering new equipment . . . not design alone, nor materials, nor fabrication . . . but all of these, and more, as they affect process, product, sales, profits. Lukenomics brings to bear not only Lukens own products, services and knowledge of materials but marshals, as well, the highly specialized skills and services of industry's most experienced engineers and equipment manufacturers.

To obtain the advantages of equipment built by fabricators applying the Lukenomics principle, write our Manager of Marketing Service, Lukens Steel Company, 400 Lukens Building, Coatesville, Penna.

This efficient rotary kiln reduces hydrated potassium carbonate $2K_2CO_3 \cdot 3H_2O$ to pure K_2CO_3. To avoid metallic pickup and insure long life despite corrosive conditions it was fabricated of Lukens Nickel-Clad Steel by The Squier Co., Division of Buffalo Forge Company.

LUKENS

LUKENS STEEL COMPANY

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Solves all these Problems for you:

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MISALIGNMENT
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If you use tubing to convey liquids, gases or semi-solids, Titeflex can help you do it better, at less cost. Titeflex flexible tubing is made in brass, bronze, stainless, monel and inconel, to fill most heat, pressure and corrosion requirements. It's made in a full range of sizes, complete with any required types of fittings. In addition, Titeflex is *all-metal*, does not depend on packed sliding joints for its flexibility. That's why it is more resistant to fatigue . . . why it *lasts longer*.

Write us for catalog outlining Titeflex advantages in full.

Titeflex, Inc.

500 Frelinghuysen Ave., Newark 5, N. J.

TITEFLEX ALL-METAL FLEXIBLE TUBING STAYS TIGHT WHEN THE GOING IS TOUGH.

water-white tricresyl phosphate, the petroleum-based Celluflex is often preferred for such critical applications as the plasticizing of vinyl films. Celanese, biggest producer of this chemical, also continues to offer coal-tar-based Lindol, long a standard in the industry.—*Celanese Corp. of America, 180 Madison Ave., New York 16, N. Y.*

Organic Primer

(174a) Primer for metals, developed by the Princeton Paint Laboratories and hitherto known as Aviation Primer No. 10, is to be manufactured and sold by United Chromium Inc., to which the Princeton Paint Laboratories has granted a license. This organic coating eliminates the need for pretreating such hard-to-coat metals as aluminum, magnesium, zinc and stainless steel. The product will be marketed as Unichrome Primer A.P. No. 10.—*United Chromium Inc., 51 East 42nd St., New York, N.Y.*

Poultry Spray

(174b) Virus spray, developed by the Raymond C. Crippen Research & Development Laboratories in cooperation with the Atlantic Supply Co. of Baltimore, Md., aids in preventing the spread of virus infections among poultry flocks. Tests show it to be effective against coryza, Newcastle disease and similar virus infections.—*Raymond C. Crippen Research & Development Laboratories, Fleet St. & Central Ave., Baltimore 2, Md.*

Water-Repellent Coating

(174c) Polysiloxane resin is contained in Ranetite No. V Transparent, new improved water-repellent coating made by the Ranetite Manufacturing Co., Inc. This coating is used to render outside masonry walls, above grade, impervious to water, rain and dampness. Ranetite No. V Transparent sells for $5.50 per gal. in 1- and 5-gal. cans, and $5.25 per gal. in 55-gal. steel drums.—*Ranetite Manufacturing Co., Inc., 1917 South Broadway, St. Louis 4, Mo.*

Poultry Feed

(174d) DL-Methionine, feed grade, has been cut in price by Dow Chemical Co. Its new price is $3 per lb. Immediate objective, of course, is the poultry feed market.—*Dow Chemical Co., Midland, Mich.*

—*End*

Better-than-ever Spry...
HERE'S ONE REASON WHY!

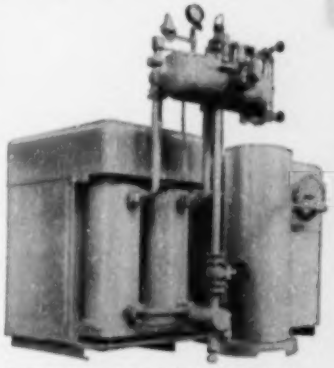
THERE ARE PLENTY of good, sound reasons why new "Better-than-ever" Spry has become a baking and frying favorite of American housewives by the millions. Basically, however, it's a matter of improved product quality . . . brought about by better ingredients, better manufacturing methods, better equipment.

And that's where Votator comes in...

At both the Hammond, Indiana and Edgewater, New Jersey plants of Lever Brothers Company, Votator processing apparatus plays an important role in the conversion of vegetable oils into pure, bland, creamy-white Spry.

Lever Brothers, like many other prominent oil-processors, quickly recognized the advantages of continuous operation that increase production, controlled operation that assures consistent high quality, and closed-system operation that safeguards product purity. They were keenly interested, too, in the savings effected in labor, space, and production time.

What Votator processing apparatus has accomplished for Lever Brothers, it can do for you. Remember this: *if you process any liquid or viscous material involving the transfer of heat, it will pay you to call or write today.*



VOTATOR HEAT TRANSFER APPARATUS

VOTATOR DIVISION

THE GIRDLER CORPORATION

LOUISVILLE 1, KENTUCKY

VOTATOR is a trade mark applying only to products of The Girdler Corporation

Cold Rubber

Article page 102

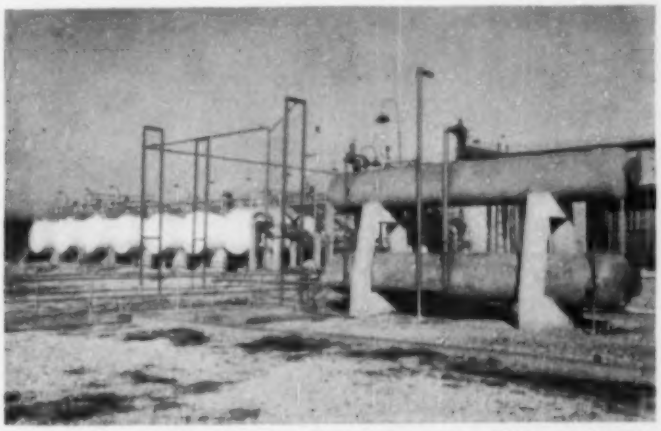
This is the Goodyear plant at Houston, Tex., converted last year from continuous polymerization at 122 deg. F. to continuous polymerization at 41 deg. F. Its capacity is 15,000 long tons of "cold" GR-S per year.

There are four main steps in the process: preparation of the formula, continuous polymerization in the reactors, removal of unreacted butadiene and styrene from the resultant latex, recovery of the polymer from the latex.

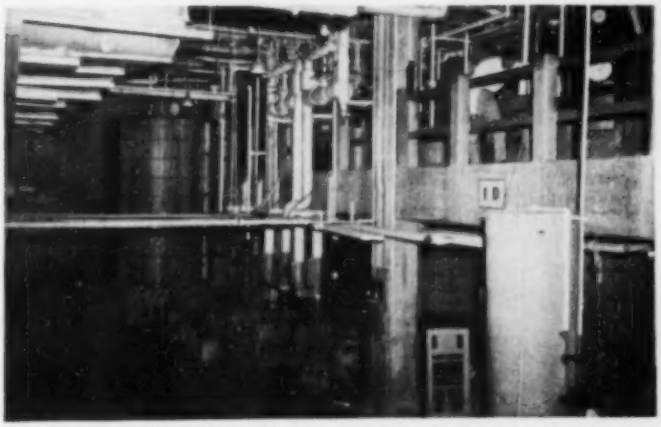
1. *Preparation of Formula*—The formula is divided into three portions. The first portion contains the monomers, butadiene and styrene, plus a mercaptan which modifies the plasticity of the resultant polymer. Butadiene is pumped from the tank farm through a caustic scrubber (to remove inhibitor) and into a surge tank; then through a rotameter and into the charge header. Styrene is pumped in through its own surge tank and rotameter, and modifier is injected just before it enters the charge header. The second portion of the formula is the soap solution, made in a 3,000 gal. wood tank. The emulsifier (rosin soap) and a very small amount of electrolyte (trisodium phosphate) are added to a tank of softened well water, dissolved, and the solution pumped through a rotameter to the charge header. The third portion of the formula is the activator solution, prepared in a 5,000 gal. wood tank. Potassium pyrophosphate and dextrose are first dissolved, heated to near boiling for a short time, rapidly cooled to 110 deg. F., and the predissolved ferrous sulphate added. The finished solution is pumped through an orifice meter to the charge header.

All three portions are pumped continuously to the charge header and through a cooler ahead of the first reactor. The catalyst, an organic hydroperoxide, is injected just before

A CHEMICAL ENGINEERING PICTURED FLOWSHEET



1 Recycle and fresh monomers are blended and stored in tank farm. Inhibitor is removed from blended butadiene by caustic scrubber in right foreground.



2 Activator solution and soap solution are prepared in these large tanks and pumped continuously to the reactors. Goodyear uses potassium rosin soap.

CHEMICAL ENGINEERING
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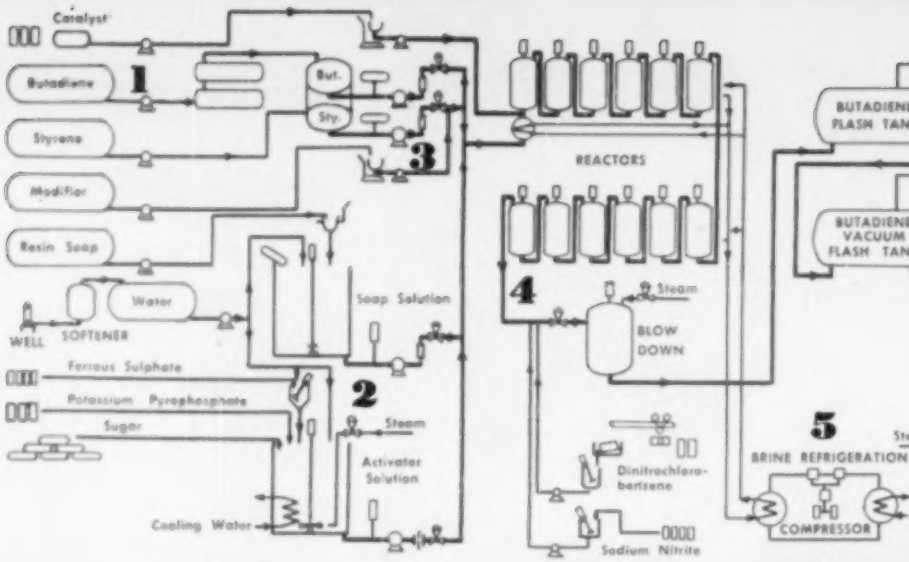
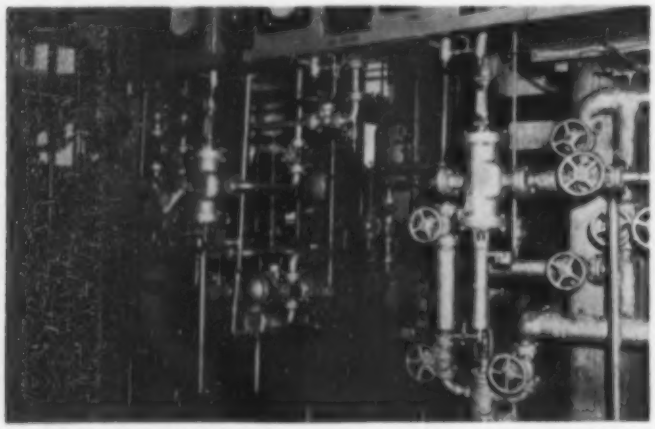
the ingredients enter the first reactor. In the preparation of all the ingredients great pains are taken to exclude air (see article); oxygen slows the polymerization reaction.

2. *Continuous Polymerization*—Each reactor is a 3,750 gal. glass-lined vessel, agitated and jacketed. Refrigerated brine in the jackets holds the reactors to an operating temperature of 41 deg. F. Total holdup time in the 12-reactor line is 17½ hr. Conversion percentage is 60 percent; i.e., 60 percent of the monomers is converted to polymer.

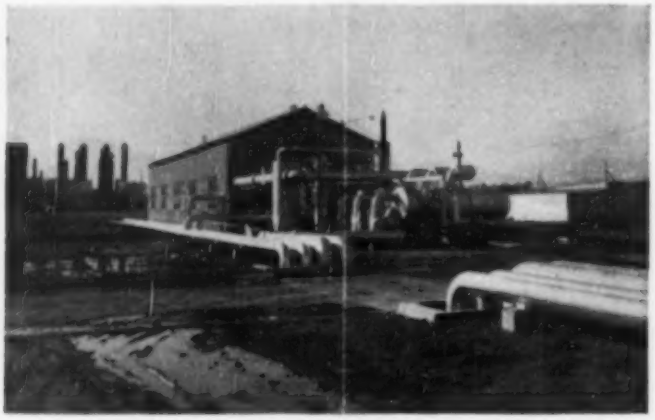
3. *Recovery of Butadiene and Styrene*—Unreacted butadiene is recovered in successive flash tanks, styrene in a steam stripping column. Both are recycled back to the tank farm and blended with new material.

4. *Recovery of Polymer*—With butadiene and styrene removed, the latex is blended, then coagulated with an acid brine solution. Coagulated polymer is filtered from the slurry and a hammer mill at the filter discharge breaks the cake into crumb. In final operations the crumb is dried, baled, dusted, and sewed in packages.



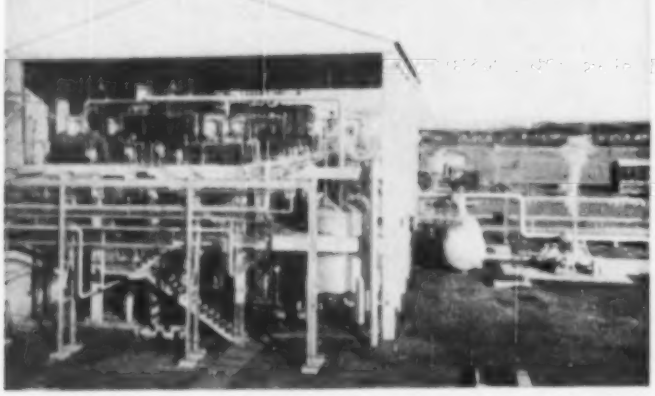


3 Rotameters regulate flow of monomers and soap solution to reactors. Orifice meter is used on activator solution: it may contain a little precipitate.

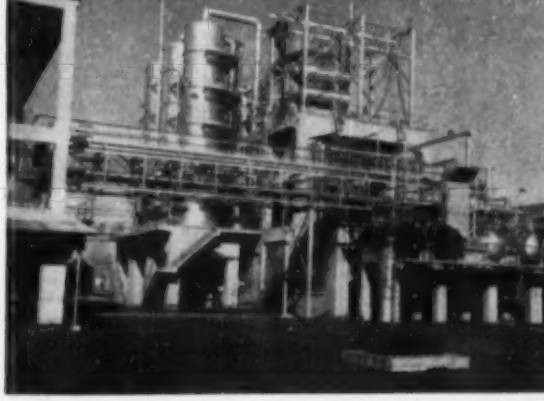


5 Refrigeration chills calcium chloride brine, which cools reactors to 41 deg. F. Reciprocating gas engine ammonia system was chosen as most economical.

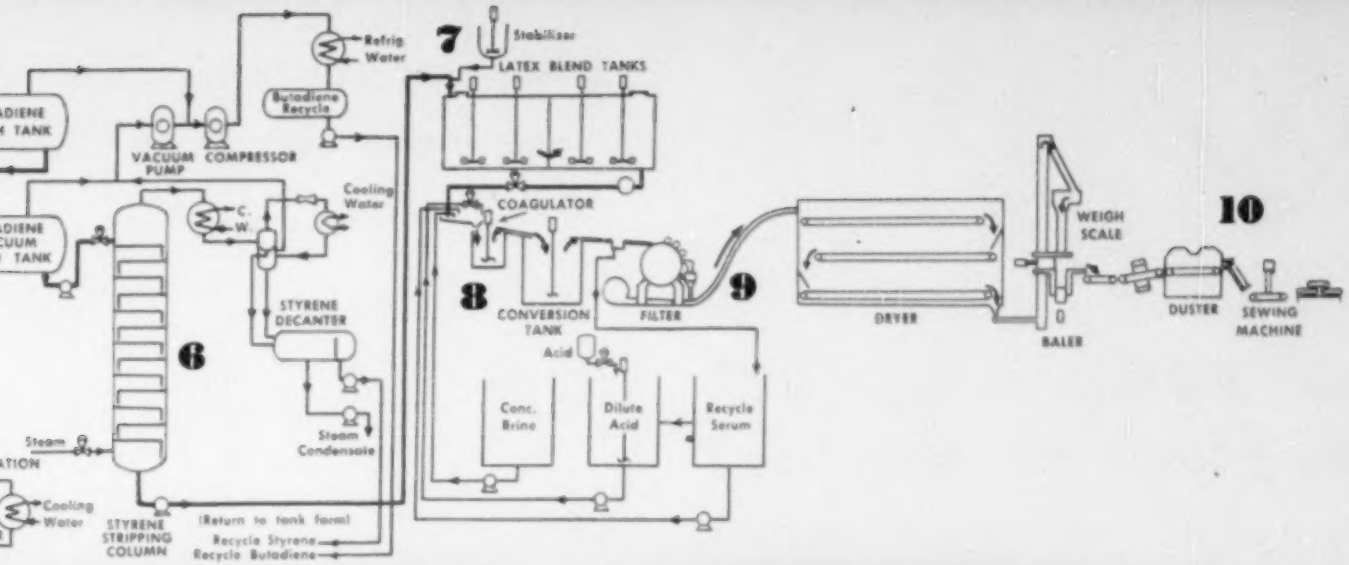
7 The latex is c... here on, operat...

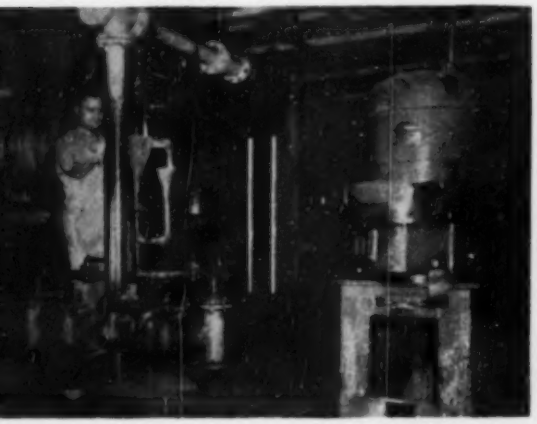


4 Polymerization occurs in jacketed reactors, top floor. Latex is received in blowdowns, mezzanine floor. At right is cold brine surge tank and pump.

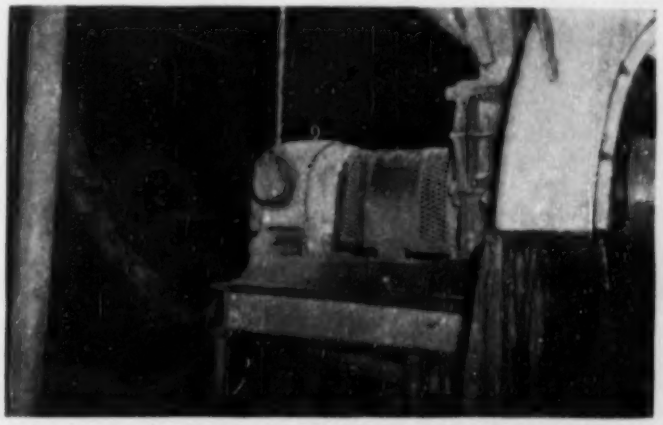


6 Unreacted monomers are stripped out of latex in recovery buildi... percent of hydrocarbon charge gets polymerized; balance is recycled





is coagulated by adding it to a brine and dilute acid solution. From operations are about the same as they were for regular GR-S.



9 Hammer mill under rotary filter. Filter recovers coagulated rubber, hammer mill breaks it up into crumb, air conveyor at left carries it to dryer.

building. Only 60 cycled.

8 Stabilizer is added to latex entering blend tanks. Premature coagulation was one of the early difficulties in converting the unit from regular GR-S.

10 Finished bale duster, package sewing machine. Goodyear started cold rubber pilot plant work in February 1949, had this big unit converted by August.

It was 1912—and the Irving Berlin song, "When the Midnight Choo-Choo Leaves for Alabam" was the hit of the music halls—when we introduced "Flexitallic", the *original* Spiral-Wound Gasket, and opened to Industry new fields of opportunity in the confining of fluids at high pressures and high temperatures.

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That is why the great oil refineries, chemical industries, power plants, shipyards, ship operating companies and others, seriously concerned with high pressures and high temperatures, specify Flexitallic Gaskets . . . They know *from experience* that, in-place-on-the-job, Flexitallic is the most economical buy.

Flexitallic Gaskets are Spiral-Wound of preformed, spring-like metal, alternating, ply for ply with either metallic, or non-metallic filler. The V-shaped, interlocking crimp, imparted during the preforming process, gives Flexitallic Gaskets a flexibility which provides the necessary high resiliency for self adjustment to changes in operating conditions and bonding pressures.

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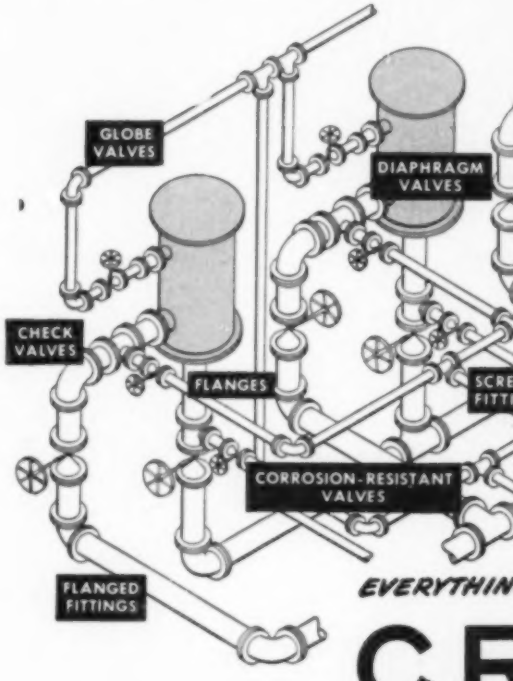

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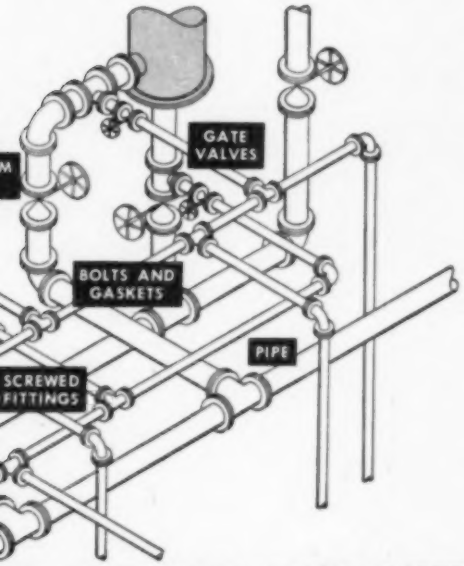

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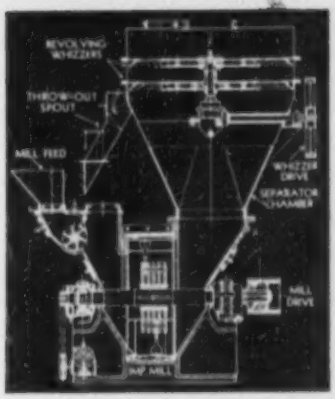

Cross-section showing location of revolving whizzers in the separating chamber. One simple adjustment controls the fineness.

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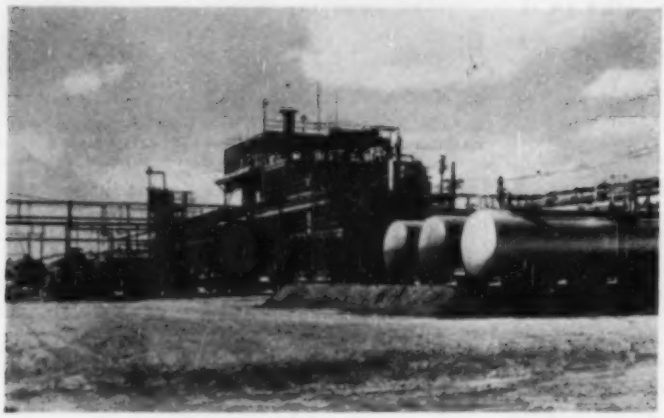
Chemical Engineering News

JOSEPH A. O'CONNOR, *News Editor*



Dow's Unique West Coast Plant Turning Out Synthetic Methionine by Four-Step Process

First plant to make synthetic DL-methionine (above) is now being operated by the Great Western Division of Dow Chemical Co. at Pittsburg, Calif. The plant cost about $1 million and is turning out 2,000 lb. of product daily. It is the first of its kind to make synthetic amino acids to fortify protein-deficient feeds. This development promises to open up a new era in the field of animal nutrition.

Basic raw materials are oil and natural gas, oxygen, ammonia, carbon dioxide, caustic soda and hydrochloric acid. One of the major starting raw materials in the actual synthesis is acrolein, which is supplied by Shell Chemical Corp. Shell makes acrolein by the direct catalytic oxidation of propylene, available in volume from oil cracking. Methyl mercaptan, another starting material, is a byproduct of gasoline refining. The sodium cyanide required can be produced in several different ways starting with natural gas and ammonia. Dow uses caustic soda and hydrochloric acid made at its own Pittsburg plant.

Here's how the four-step process works: (1) acrolein is reacted with methyl mercaptan to form beta-methylmercaptopropionaldehyde, which is (2) reacted with sodium cyanide and ammonium carbonate to give 5-(beta-methylmercaptoethyl) hydantoin, which is then (3) contacted with caustic soda solution to form DL-sodium methionate; and (4) the methionate is treated with hydrochloric acid to yield the product DL-methionine.

The new plant is a low-cost producer of methionine, which is now being supplied to the poultry market at $3 per lb. for blending with soybean meal and cottonseed meal. Methionine is one of the amino acids essential for the normal growth and health of animals and poultry (see *Chem. Eng.*, Aug. 1949, p. 74).

Celanese Shipping Methanol From Texas by Tanker

Opening of new bulk terminal facilities at Carteret, N. J., for the distribution of methanol is announced by the chemical division of Celanese Corp. of America. Methanol is produced at the company's plant at Bishop, Tex., and shipped by tanker from nearby Corpus Christi to the New Jersey terminal, from which point it is distributed in tank trucks, tank cars and drums to industrial consumers in the Middle Atlantic and New England states.

This is the second in a series of tanker movements of industrial organic chemicals to large markets in the northeast, by Celanese. In 1948 the company pioneered in the water transportation of bulk formaldehyde from Corpus Christi to New Haven, Conn.

Soil-Stabilizing Chemicals To Harden Landing Beaches

If gyrenes and dogfaces ever have to hit the beaches again, chemicals are going ashore with them to help save the lives of some of them. Both the Navy's Bureau of Yards and Docks and the Army's Engineer Research and Development Laboratories are hard at work on processes for treating loose sand and poor soils with chemicals to make them serviceable for military operations within a few hours.

Objectives of the two projects are not precisely the same. The Army Engineers, with whom John B. Wilbur and his civil engineering department at MIT are cooperating, aim to develop a process that will quickly convert an ocean beach, muddy road or soupy field into a stable, rubbery surface that will support landing operations, movement of heavy vehicles or landing of aircraft. At the request of the Marine Corps, the Navy is working primarily to densify beach sands even more quickly to reduce loss of life in landing operations. Navy results, of course, apply also to roads and airstrips.

The Navy experiments, under the direction of Hans F. Winterkorn of Princeton, have advanced to high-speed stabilization of various sands with standard road-building equipment and employing chemicals costing less than 16 c. a lb. Two common road-building machines — a Seaman pulverizer and a P & H stabilizer — applied the chemicals, mixed them into the soil and struck off the mixture to a smooth surface that would support fairly heavy vehicle loads 2 to 3 hr. later.

Chemicals used in the Navy's process are a furfural resin and aniline. Chemically, the process involves low-temperature condensation and polymerization of the two liquids through introduction of a catalyst. As the rate of hardening is controlled by the

(*Continued on page 186*)

Texas City Three Years After

H. T. Ray

DISASTER struck Texas City three years ago, sending smoke mushrooming skyward. Today, Texas City, having made a heroic comeback, is again a booming center of chemical enterprise.

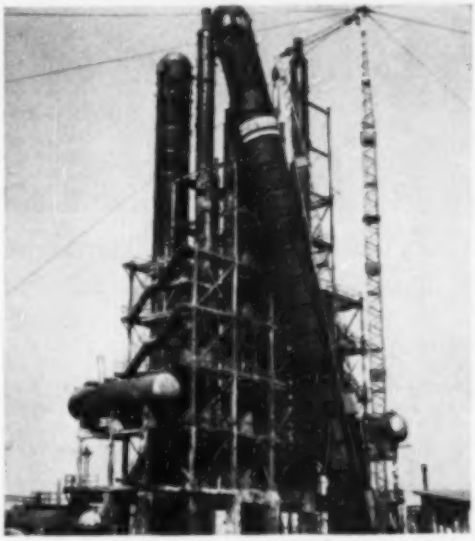
Undaunted by one of the worst disasters in U. S. history, Texas City in three years has made a remarkable recovery. For horror concentrated in a few city blocks nothing in American Red Cross annals surpasses the explosion at 9:12 a.m., April 16, 1947. Dead and missing numbered 512; more than 2,000 were injured; property losses totaled $50 million. This third anniversary of the catastrophe finds Texas City, with its process industries, not only recovered from the enormous losses but setting new records.

Less than a week after the almost total destruction of Monsanto Chemical Co.'s plant, President William M. Rand announced that his company was in Texas City to stay and would rebuild. "The decision to rebuild was immediate and spontaneous. Rebuild with a more efficient better unit and with a plant that would be a worthy monument of the young ideas of the men who were here before; and so we stayed in Texas City," Rand stated at the dedication of the new plant. Recently, the new styrene plant won four safety awards for operating more than 1,000,000 man-hours without a lost-time accident.

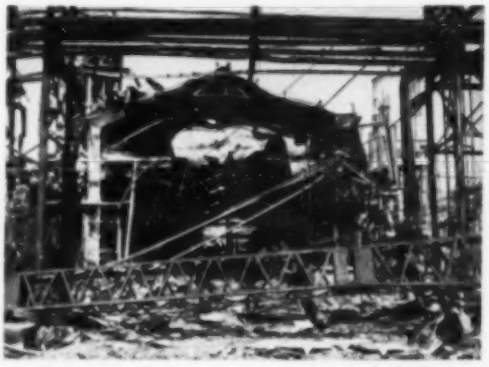
Like Monsanto, the other chemical and petroleum companies, not as hard hit, have courageously repaired their damaged plants and gone ahead with expansion plans. With 35 lives lost and its $2.5 million refinery destroyed, Republic Oil Refining Co. put up a new refinery that now employs 425 to process 36,000 bbl. of crude a day. Pan American Refining Co. lost 12 employees, damages to its docks came to $750,000. Nevertheless, Pan American rebuilt, teamed up with Carbide & Carbon Chemicals Corp. to bring Brazos River water to Texas City, and is still expanding its refinery, which handles more than 100,000 bbl. of crude a day. Pan Am has 1,800 employees; its 1949 payroll was $8.5 million. Carbide's plant, two miles from the blast, escaped serious damage. Nine storage tanks and a slip have been replaced. Four Carbide employees were among the casualties. Today, Carbide employs 1,500 to make some 35 organic chemicals, and is adding capacity for vinyl resins and methanol.

Chemical plants and petroleum refineries at Texas City were valued at $129,352,000 in 1948. Since then, about $15 million has gone into construction, bringing the total to about $144 million. Value of products is reported to be $466,750,000. The 500 business and industrial firms have a combined annual payroll of $22,825,000. Total industrial employees number 7,350. Population has reached 27,000, with new stores, schools and homes going up.

With abundant natural gas, petroleum and sulphur, plenty of fresh surface water, rail and water transport, as well as a large labor force, Texas City today is a booming chemical center. With indomitable faith in its future, the survivors of the horrible catastrophe of three years ago are at work removing the few final scars remaining from that ordeal.

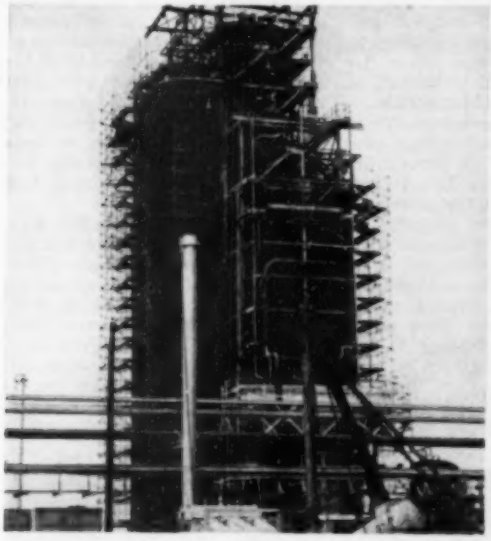


DISMANTLING of these damaged distillation towers was preliminary work as Monsanto got ready to rebuild its plant.

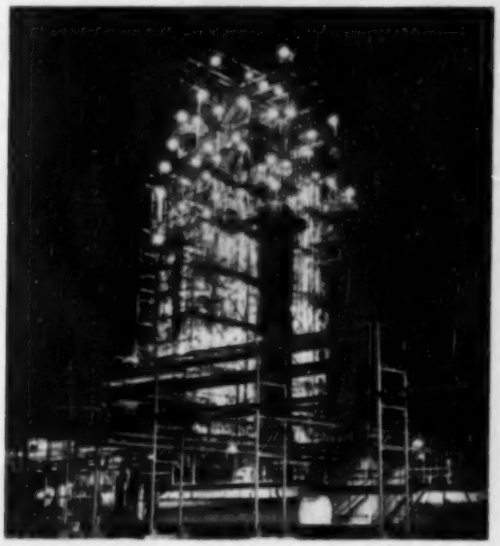


WRECKED compressor house was part of Monsanto's ethylene unit. Beam came from dragline that was moving through plant.

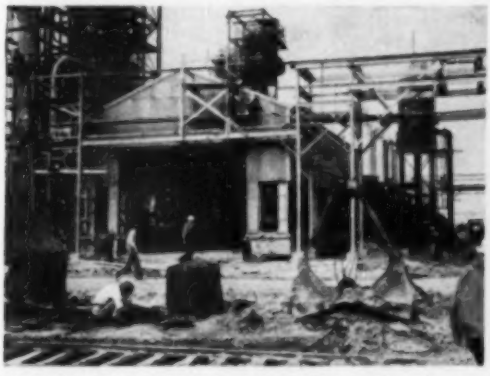
REBUILT PLANT OF MONSANTO cost $16 million. First unit of the new styrene plant began operating April 1, 1948, just short of a year after the disaster. Other units were running six months later. Monsanto's plant, closest to the exploding vessels laden with cargoes of ammonium nitrate, was almost totally destroyed; 145 Monsanto employees died.



RECONSTRUCTION of the distillation towers was partially completed at this stage. Monsanto was making its comeback.



RUNNING AGAIN, the distillation towers, now rebuilt, light up night, a symbol of Monsanto's faith in Texas City.



REBUILDING had reached an advanced stage when the compressor house, battered by the blast, began to take form anew.

COMPLETED compressor house, back in operation, is here seen from side, with motor exhausts ranged along its length.

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catalyst, the hardening time can be shortened by using other catalytic agents. The catalyst now employed was chosen because it is the best available agent that can be used with ordinary road-building equipment. The machines require a certain amount of time for mixing and striking off the soil. New equipment is being designed for faster stabilization.

At the Army's Engineer Research and Development Laboratories, Fort Belvoir, Va., laboratory batches of stabilized soil have been made and test samples exhibited. The Fort Belvoir tests were made with calcium acrylate that had to be produced in laboratory quantity as the chemical was not commercially available. Following the calcium acrylate, a catalytic mixture of sodium thiosulphate and ammonium persulphate was added to the aqueous soil mixture. From this point on, action had to be fast, as the material then solidifies quickly.

To conserve the limited quantity of calcium acrylate, small batches were prepared in a steel-drum rotary mixer and were placed in 2x4-ft. patches 3 in. thick. As desired, the mixture retains a rubbery, elastic character for 2 to 5 hr. to permit adjustment to the support of the underlying soil.

After that time, the stabilized soil becomes rigid and concrete-like until it is rewetted. Upon being soaked again, the material resumes its rubbery character, thoroughly stable and not at all slippery.

A difficult soil—Virginia sand-clay—was chosen for the first tests. The test panel was laid in a lane along with other panels of soil stabilized with portland cement, asphalt and other materials.

Both in supporting heavy vehicle loads and in withstanding the effects of flooding, the chemically stabilized soil proved far superior to the others. It withstood repeated passage of vehicle loads up to 35 tons and flooding for 48 hr. After such a soaking, the material was as strong and flexible as when first placed. Wheel loads of the heavy vehicles ran up to 20,000 lb. When such a load stood on the chemically stabilized soil for a long period, it caused a depression. But when the load was removed, the depression disappeared and the rubbery material came back to a level surface.

The process can be used on soils containing as much as 30 percent water by weight. Calcium acrylate is the basic chemical; it is adsorbed by the soil particles. The other two compounds, sodium thiosulphate and ammonium persulphate, cause the calcium acrylate molecules to lock themselves together. Thus the soil particles are joined in a simple, fast chemical reaction.

About 13 lb. of chemicals were used for the 8 sq. ft. of the test section, which was 3 in. thick. That means about 16 lb. per sq. yd., or about 84 tons for a mile of 18-ft. wide road, or 800 tons for a 150-ft. wide airstrip 6,000 ft. long.

While scarce and costly now, calcium acrylate should become less expensive when produced in quantity.

(Continued)

NEW EXTRACTION PLANT TO PROCESS SOYBEANS

Now in operation, this new extraction plant at Iowa Falls, Iowa, which was built by Blaw-Knox Co., will add more than 200 tons a day to Ralston-Purina Co.'s soybean processing capacity. Daily output at full operation is 9,000 gal. of soybean oil and 160 tons of meal. Deodorized meal is cooked in a Blaw-Knox pressure toaster to make it palatable in feeds. At Bloomington, Ill., Blaw-Knox has just completed another 200-ton soybean plant for Ralston-Purina.

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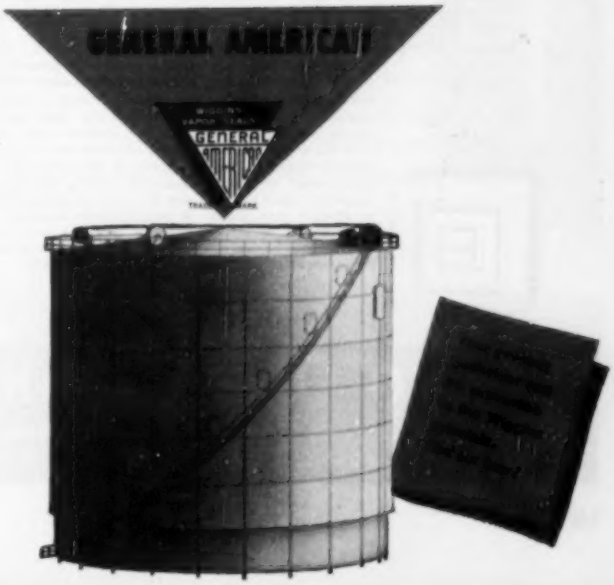

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PROTECTIVE PACKAGING is now, by far, the most important use of wax. Because of its marvelous preservative qualities, inherent in its low water vapor transmission, wax guards the freshness and potency of the foods and drugs consumed by the world's population. This unseen protective film encircles our bread, our fruits, cough-drops, doughnuts, tobacco, and literally hundreds of other products. And here is the amazing fact—the end is not yet in sight.
THE WATER-REPELLENT fabric industry has already found wax to be essential in their processing procedures. Many materials have been developed, using wax, that allow much more freedom of fabric use in all types of weather. Wax is also being employed in the processing of wool and cotton thread to reduce fuzz. And, of course, it is common knowledge that waxes have been used for years in sizing compounds as plasticizers and in all types of leather dressings.
THERE ARE, naturally, products that are composed almost entirely of wax formulations, such as candles, crayons, shoe polishes, floor waxes, furniture polishes, stage make-up, auto waxes, and Madam's cosmetics. However, it is in the large "hidden" industries that wax, upon examination, really stands out . . . . electrical insulation . . . . printing inks . . . . the rubber industry . . . . explosives . . . . adhesives . . . . pharmaceutical industry in medicinal creams and salves.
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the Fort Belvoir researchers believe. Mixing methods are under development. At present, a two-step method, incorporating the chemicals in aqueous solutions during the mixing period of several minutes, appears best.

(Continued)

CONVENTION CALENDAR

Electrochemical Society, annual meeting, Hotel Statler, Cleveland, April 19-22.

American Society of Mechanical Engineers, Process Industries Division and Pittsburgh Section, joint conference, Hotel William Penn, Pittsburgh, Pa., April 24-27.

Association of Consulting Chemists & Chemical Engineers, Hotel Shelbourne, New York, April 25.

American Wood Preservers Association, annual meeting, Rice Hotel, Houston, April 25-27.

American Oil Chemists' Society, spring meeting, Atlanta Biltmore Hotel, Atlanta, May 1-3.

American Institute of Chemists, Hotel New Yorker, New York, May 11-12.

Society of Cosmetic Chemists, semi-annual meeting, Savoy Plaza Hotel, New York, May 19.

American Gas Association, production and chemical conference, Hotel New Yorker, New York, May 22-24.

Society for Experimental Stress Analysis, spring meeting, Hotel Statler, Cleveland, May 25-27.

American Institute of Chemical Engineers, regional meeting, New Ocean House, Swampscott, Mass., May 28-31.

American Pharmaceutical Manufacturers Association, annual meeting, Broadmoor Hotel, Colorado Springs, Colo., May 29-31.

American Leather Chemists Association annual convention, French Lick Springs Hotel, French Lick, Ind., May 31-June 2.

Chemical Market Research Association, annual meeting, Hotel Roosevelt, New York, June 8.

Conference on Industrial Research, costs, budgeting and economics of industrial research, Columbia University, New York, June 12-16.

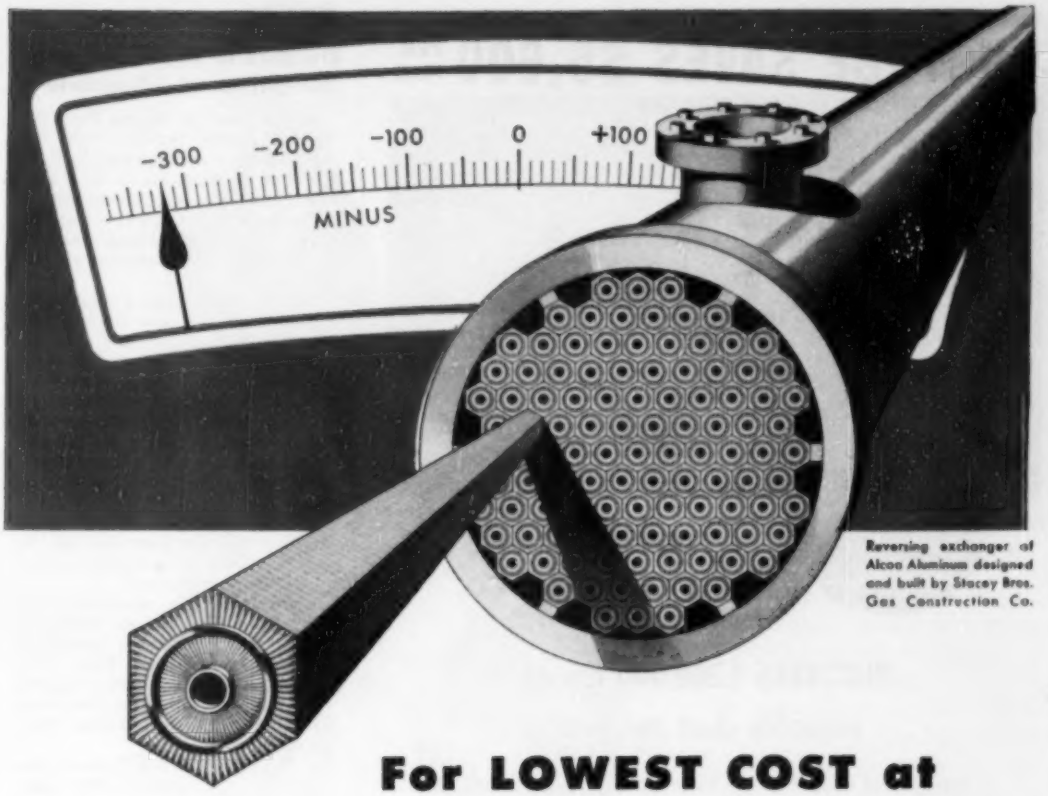
Manufacturing Chemists Association, annual meeting, Hotel Monmouth, Spring Lake, N. J., June 19-20.

Chemical Institute of Canada, 33rd annual conference and exhibition, Royal York Hotel, Toronto, June 19-22.

American Society for Engineering Education, annual meeting, University of Washington, Seattle, June 19-23.

American Council of Commercial Laboratories, Cleveland, June 22-23.

American Society for Testing Materials, 53rd annual meeting, Chalfonte-Haddon Hall, Atlantic City, June 26-30.



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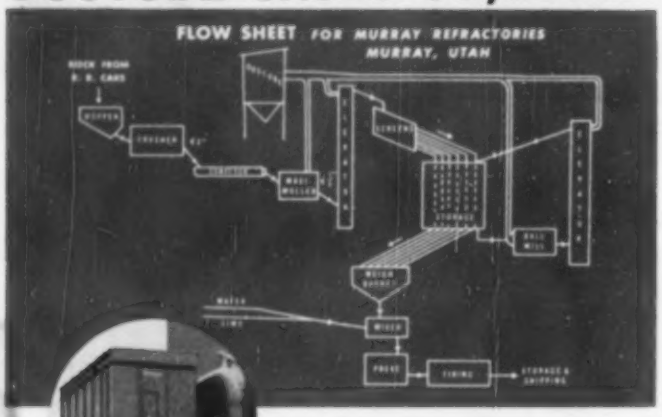
DUSTUBE SAVES $6,600 PER YEAR



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RECOVERS 1,200,000 *lbs. of valuable dust per year*

A mountain of silica dust was blown across the countryside each year before Murray Refractories discovered the Dustube. The Dustube was installed to improve working conditions but it quickly changed this dust nuisance into a sweet profit of $6,600 a year. It collects all dust created in the manufacture of 300,000 silica bricks per month. It ventilates the grinding, screening, elevating and other handling operations (shown in diagram above) to make Murray Refractories a better place to work.

Recent experiments have suggested a new use for this dust that will make it even more valuable. Mixed with a bonding agent, this dust makes an excellent mortar for use in kilns, open hearth furnaces and annealing furnaces.

You may be throwing away possible by-products worth thousands of dollars in your plant too. *Why not call in Dustube Engineers for a survey of your plant. They will show you how Dustube can cut your costs and increase your profits. There's no obligation of course.*

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Du Pont to Double Capacity For Output of Adiponitrile

A new plant at Niagara Falls, N. Y., will double facilities there for the production of adiponitrile by E. I. du Pont de Nemours & Co., Inc. Adiponitrile, chemical intermediate in the manufacture of nylon, is made in Niagara Falls from furfural, which is manufactured from corncobs and oat hulls.

The process for making adiponitrile from furfural has been firmly established as fully competitive with alternate methods of manufacture from derivatives of coal and petroleum, according to Ross Hare, plant manager at Niagara Falls. He credits research and development work in the Niagara Falls laboratories during the past year with putting the process on its economic feet.

"We'll need about 100 additional men for the new jobs that will be provided when the new plant is completed," Hare points out.

Furfural for the manufacture of adiponitrile is made in Memphis, Tenn., from agricultural byproducts and shipped to Niagara Falls. The nylon intermediate, in turn, is shipped from there to another Du Pont plant at Belle, W. Va., for further processing.

"This is a lot of new business coming out of research," Hare says. "When the new project is finished about 400 million pounds of corncobs and oat hulls will be used annually in the manufacture of furfural for the Niagara Falls plant.

"In addition to adiponitrile we make several other important industrial chemicals from furfural. The principal ones are used as solvents and chemical reagents."

Among the chemicals that Du Pont gets as byproducts of its synthesis of adiponitrile from furfural are 1,4-dichlorobutane, furan and tetrahydrofuran. Other chemicals slated for commercial production: pyrrole and pyrrolidine.

"Work on the new building and manufacturing equipment will be started about the middle of this year," says Hare, "and will be completed late next year."

Ohio Basin Industries Called To Account on River Cleanup

Industries discharging wastes into waters of the Ohio basin will be asked to send representatives for group conferences with the Ohio River Valley Water Sanitation Commission to re-

(Continued)

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There's more than just one type of stainless steel . . . because *stainless* applies to a family of steels. And in order to get the best possible results from stainless in your application, the *right* analysis must be used.

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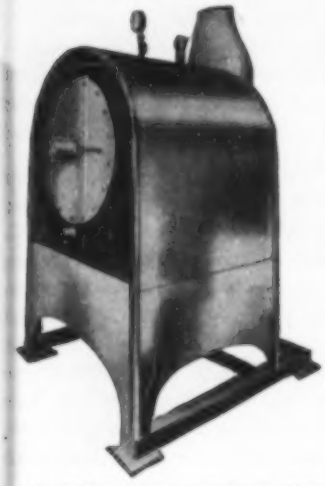

Field tests over several years have proven the Stabilizer highly efficient. Thin material is delivered thru a feed pipe at one end of the Stabilizer and a patented specially designed rotor forces the liquid to present a very large surface area for heating and vapor release. The concentrate flows from a discharge pipe at the opposite end and evaporated vapor leaves thru the stack. Short treatment time, a matter of minutes, permits retention, without damage, of heat-sensitive components being handled. Six sizes available with evaporation rate from 600 to 12,000 lbs. per hour. Unit requires limited floor area.

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News, cont. . .

port on progress in treatment installations and to clarify any misunderstandings regarding their responsibilities in the eight-state campaign for steam cleanup. This was voted at the quarterly meeting of the commission held in Cincinnati just recently. Approval was also given to a resolution urging the federal government to assume costs for providing low-flow regulation in the proposed Mahoning-Grand River floodway in Ohio.

"More than a year has elapsed since all the industrial plants in the valley listed by state authorities were advised that an interstate agreement on pollution-abatement is in operation," said the commission chairman, Joseph L. Quinn, Jr. "Now we want to determine what has been done in this period as well as hear from industry groups how the commission can expedite progress in the control of certain waste discharges."

The date of the first conference and the specific industry group to be interviewed will be announced soon.

During its two-day meeting the commission sponsored a joint luncheon with members of the national Water Pollution Control Advisory Board of the U. S. Public Health Service who were visiting Cincinnati. The board was given a detailed accounting of waste disposal plants now under construction and in the design stage by the chief sanitary engineers of the eight states represented on the commission. The board also learned that the commission is planning active support of federal legislation to provide tax relief for industries that undertake construction of waste-treatment facilities.

Vice-Chairman Henry Ward of Kentucky informed the board of his collaboration with the commission in the drafting of a new anti-pollution law for his state. He stated that this will soon be ready for submission to the Kentucky legislature now in session.

Asserting that widespread sanitation benefits to the entire Ohio River would be secured by providing means for the regulated discharge of water from the proposed Mahoning-Grand River Floodway in Ohio, the commission passed a resolution urging that the cost of such facilities be borne by the federal government.

The Mahoning flood-control project near Warren, Ohio, on which hearings are being held by the U. S. Corps of Engineers, was said to provide the

(Continued)

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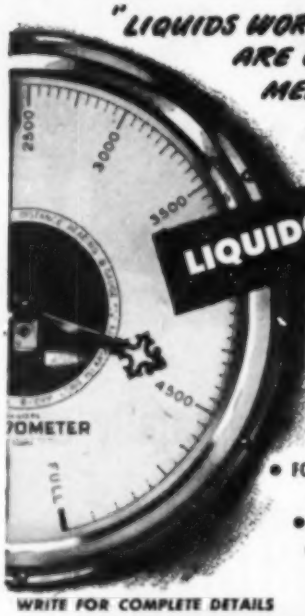

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Oxalic Acid
Phosphoric Acids
Carbamide Phosphoric Acid
Phosphoric Anhydride
Phosphorus
Phosphorus Oxychloride
Phosphorus Trichloride
Potassium Phosphates
Hemisodium Phosphate
Monosodium Phosphate
Disodium Phosphates
Trisodium Phosphate
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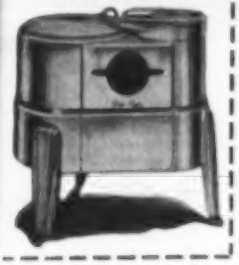

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opportunity for sound and economic realization of sanitation benefits beyond those obtainable from the construction of sewage and industrial waste treatment plants. The Mahoning was described as "one of the worst-polluted streams in the nation." Nine municipalities have already been ordered by the State of Ohio to proceed with treatment works estimated to cost more than $16 million. Use and re-use of the river by industries has raised the water to temperatures up to 120 deg. F. in the summer periods of low flow. The commission recognized that through regulated release of stored water not only could the temperature condition be improved locally, but that the increase flow would provide beneficial effects regionally by virtue of the additional dilution water in the Mahoning, Beaver and Ohio river systems.

Wages, Pensions, Insurance Agreed on By R & H and CIO

Rohm & Haas and Local 367 of the Oil Workers International Union (CIO) reached agreement recently on wages, retirement and insurance programs. This was done without threat of a strike.

Although a general increase was denied by the company, adjustments ranging from 2 to 10c. hourly were granted to approximately 80 percent of the employees in the bargaining unit.

The secretary of the local said the adjustments brought plant jobs into proper relationships with each other. Also they will enable both parties to conduct future wage bargaining on a general wage adjustment basis rather than on individual job-to-job comparisons.

First Fluid Cat Cracker in East Texas for McMurrey

First fluid catalytic cracking refinery installation in East Texas is to be constructed at the McMurrey Refining Co. at Tyler. Marvin H. McMurrey, president of the company, discloses that negotiations are now completed with Mineral Oil Products Co. for the engineering, designing and construction of the unit. Work is to start shortly with completion expected in the fall of 1950.

To be constructed at the same time as the cat cracker are a gas concentration unit and a feed preparation and cycle oil cracking unit. The gas concentration system will extract propane and butane and at the same time

(Continued)

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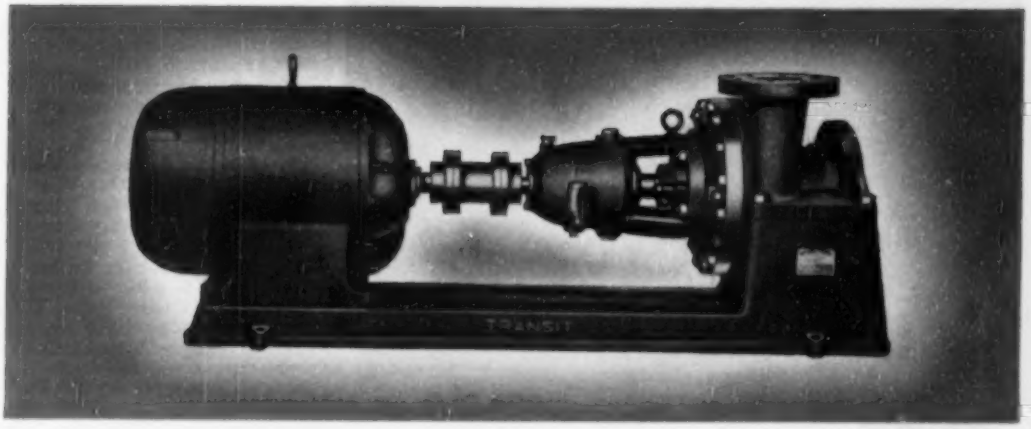

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Capacities from 3 to 55 gallons

prepare stock for the catalytic polymerization unit recently placed in operation at the plant. The feed preparation system is designed to give maximum flexibility in products selection. The entire system will have an operating capacity of 5,000 bbl. a day.

The refinery's recent expansion program includes, in addition to the polymerization unit, a modern crude distillation unit, a new steam plant, a research and development laboratory, and a general office building.

What's New in Engineering Aired by AIChE at Houston

Advances in chemical engineering occupied more than 500 of the nation's top chemical engineers during the recent Houston, Tex., regional meeting of the American Institute of Chemical Engineers. The AIChE members also inspected Gulf Coast chemical plants in Texas.

Here are some of the significant developments in chemical engineering that were highlighted at the technical sessions:

Trend in design of electrolytic cells, according to Deane O. Hubbard of Hooker Electrochemical Co., is toward larger units. One French company is now starting a plant with 50,000-amp. mercury cells, twice the size of the largest U. S. cells. It is found more economical to use Hooker Type S cells, at 8,000 to 10,000 amp., in plants as small as 5 tons daily capacity than to use small cells. In plants of 50 tons per day and larger a 20,000-amp. cell could be more economical than a 10,000-amp. cell.

CHLORINE WITHOUT CAUSTIC

A newly developed process, described by Charles P. Roberts of the Westvaco Chemical Division of Food Machinery & Chemical Corp., produces chlorine without caustic soda. It uses waste or surplus hydrochloric acid gas as the raw material and yields a high-purity chlorine gas. Cupric chloride is electrolyzed to produce chlorine gas and cuprous chloride. The cuprous chloride is then oxidized by hydrochloric acid and oxygen to produce more cupric chloride, which is returned to the electrolytic step.

By using the old Deacon process in a new method for chlorinating benzene, reported Robert M. Crawford, a consultant from Buffalo, N. Y., it is possible to convert the byproduct hydrochloric acid back to chlorine with the use of air. These reactions are carried out in a single step by passing chlorine, air and benzene through tubes containing newly de-

(Continued)

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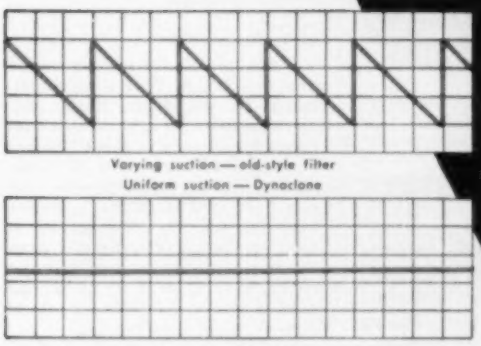
offers 5 NEW ADVANTAGES!



Varying suction — old-style filter
Uniform suction — Dynaclone

1. Eliminates mechanical shaking.
2. Provides uniform suction at dust source.
3. Assures longer bag life . . . 4. minimum maintenance.
5. Keeps itself automatically and continuously clean without additional power or equipment.

Send for descriptive bulletin just out on the new Sly Dynaclone — the ultimate in filter performance.

This revolutionary new dust filter is another Sly first. Extremely simple and thoroughly dependable, it eliminates entirely the gremlin of mechanical shaking and provides uniform suction of air at dust source.

This uniform suction is achieved by a simple device which cleans the filter bags successively by a reverse flow of air—the same suction which draws the dust onto the filter cloth is reversed to blow it off.

Since this reverse air suction operates continually, the new Sly Filter requires no shutdowns for removing dust from the cloth.

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The result of long experimentation and exhaustive tests, the Sly Dynaclone has thoroughly proved itself. It provides substantial savings over any other type of cloth screen dust collection. Write for complete information.

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Considered to be one of the foremost recent advancements in the science of fire protection, "Automatic" AER-O-FOAM has opened new avenues in fire safety which heretofore were not thought to be practical or economically feasible. Hazardous conditions familiar to chemical processing industries, metal working plants, petroleum storage and handling, electric power generation, and other occupancies where flammable liquids are involved, can now be fully safeguarded by engineered "Automatic" AER-O-FOAM protection.

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veloped catalysts, which permit operations at temperatures below 500 deg. F.

AMALGAMS

R. B. MacMullin, a Niagara Falls, N. Y., consultant, told chemical engineers of new processes for the production of such free metals as sodium, potassium, zinc, lead and lithium. Caustic soda is produced by decomposition of alkali amalgams with free water; metal alcoholates, by decomposition of the amalgams with a suitable water-free alcohol. Various metallic salts are produced by direct union of the metal dissolved in the amalgams with other metals and acid-like compounds to produce various chemicals. Amalgams, or metallic compounds containing mercury, are of growing importance in the manufacture of industrial chemicals.

REFINING CAUSTIC

A new process for refining caustic soda, described by W. L. Badger, consultant of Ann Arbor, Mich., consists of evaporating a 50 percent solution to near-dryness at about 700 deg. F. using Dowtherm vapor to supply heat. By giving the 50 percent solution a chemical treatment to remove impurities and then evaporating in nickel equipment, a high-purity product can be made without excessive corrosion. A small demonstration plant has produced continuously at the rate of 60 tons per day.

Addition of water to the furfural used in separating butadiene from other C_4 hydrocarbons makes possible operation with lower pressure steam for heating. The water also aids in simplifying equipment necessary for recovery of the butadiene. This was reported by a University of Delaware group comprising J. A. Gerster, Donald Jordan, Kurt Wohl and A. P. Colburn.

DISTILLATION CATALYSTS

How catalytic reactions of importance to the petroleum industry can be carried out by a new scheme was told to the convened AIChE members by Lloyd Berg. Working with Berg in this development are P. R. Hipperly and W. S. Reveal. All are with Montana State College at Bozeman. In this process, the catalyst and reactive materials are introduced into the middle of a distillation column. As the reaction proceeds, the products and unreacted raw materials are removed on the spot by distillation in the top and bottom of the same column. The process can be used in producing high-octane gasoline.

(Continued)

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This dependable heat insulation assures high non-conductive efficiency that lasts. Its advantages come from the scientific K&M method of compounding clean asbestos fiber with basic carbonate of magnesia, in correct proportions—with proper distribution. The result is lightweight pipe and block insulation whose structural strength contributes to application and maintenance savings.

"Featherweight" 85% Magnesia, available in all standard dimensions, is one of the many types of insulation produced by K&M. Investigate them by obtaining full data and expert information from your nearest K&M Distributor.

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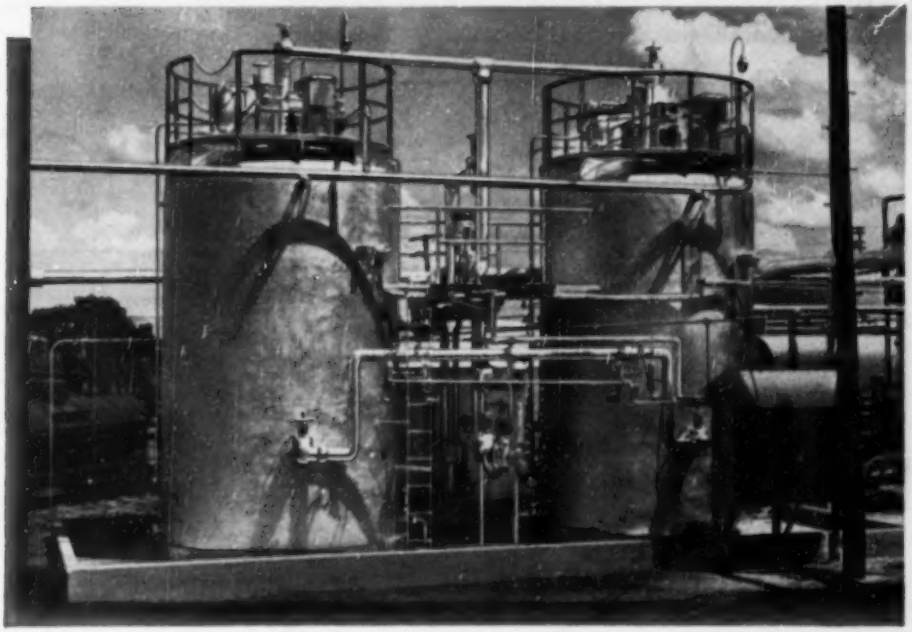

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Such a process would combine two operations in one, and require the use of much less equipment.

ETHYLENE PROCESS

In a modified process for the production of ethylene, developed by R. M. Deanesly and C. H. Watkins, both of Universal Oil Products Co., air is admitted to the catalytic reactors that produce the ethylene. Thus the heat needed to keep the reaction going is supplied by the combustion of coke formed by the reaction itself. Advantages claimed: better yields of ethylene and the ability of the reactors to use impure feed chemicals.

Extractive distillation, in which a third material is introduced into a distillation column to improve the separation of two materials that boil at nearly the same temperature, permits separations that would otherwise be prohibitive in cost were the third substance not present. According to J. M. Chambers of E. B. Badger & Sons Co., it is possible to control a column during extractive distillation even to the point of reversing the usual distillation process by boiling the heavier substance out of the lighter one.

How much free space exists in small-diameter packed columns? Heretofore, this had to be estimated. But B. J. Lerner and C. S. Grove, Jr., both of Syracuse University, have developed a technique for the direct measurement of free space by X-rays. It promises refinements in the design of packed columns.

DIFFUSION IN POROUS SOLIDS

A new mathematical concept for the shape and size of pores in porous solids that are to be extracted with a solvent was offered by Willard P. Armstrong of Washington University, St. Louis, Mo. According to Armstrong, desired materials must be removed from a porous particle by diffusion. When the solvent enters a pore in the porous particle, the wanted material dissolves in the solvent, but there is nothing to pull the solvent back out of the pore. Ultimately, the dissolved material will work its way to the surface of the particle and be washed away by the main bulk of solvent traveling by. What Armstrong has done is to answer the question "How long does it take for the stuff to get from the inside of the particle to the surface?" With the answer known, the chemical engineer can design the equipment necessary to remove the material from the tiny capillaries inside the porous particles.

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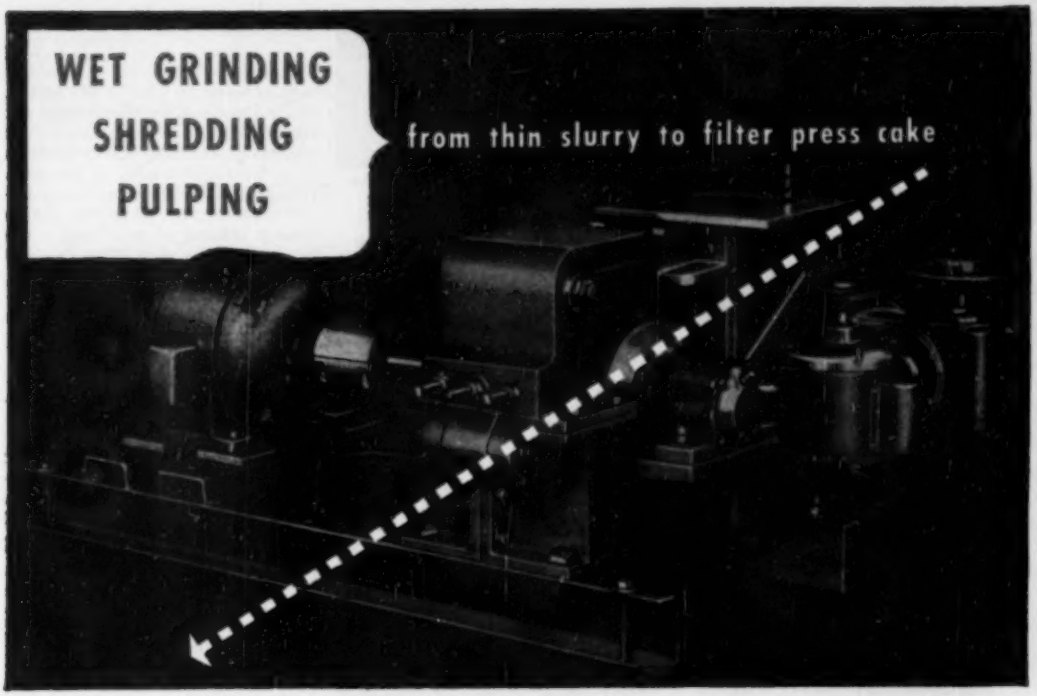
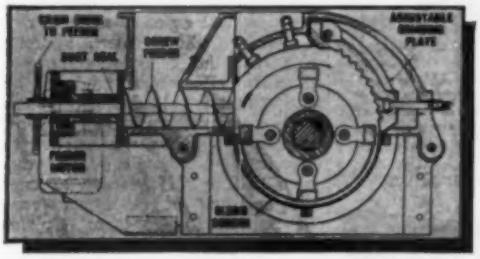


WILLIAMS HELIX-SEAL HAMMERMILL



Sectional view of Helix-Seal Mill. Note long grinding plate against which the material is ground before it reaches the sizing screen. This plate is adjustable to compensate for wear.

WILLIAMS ALSO MAKES . . .

Heavy-duty hammermills; impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "packaged" crushing and grinding plants.

Williams Mills are used by many plants for the handling of wet materials . . . from thin slurry to filter press cake. When required, special construction is supplied to overcome corrosive reactions or friction hazards. Typical applications are:

- Refining wood pulp screenings when washing through mill with a large volume of water
- Flushing industrial wastes through grinder into sewage disposal system
- Shredding cellulose acetate when suspended in process liquor
- Reducing vegetables and fruits to pulp
- Shredding food-packing plant refuse preparatory to drying for stock feed
- Crushing crude ore and rock when part of a wet processing system

Specific information about individual requirements will be sent gladly upon receipt of inquiry supplying details of your grinding, crushing or disintegrating problem.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
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WILLIAMS
CRUSHERS · GRINDERS · SHREDDERS

6 TO 1

ONE Indicator Plug Connects to any of SIX Thermocouple Jacks

MULTI-POINT PYROMETER INDICATOR

Fast Simple Versatile Accurate Compact Trouble-Free

Designed to indicate temperatures for various applications.

Indicator is automatically compensated for cold junction temperature changes and instrument temperature resistance coefficient.

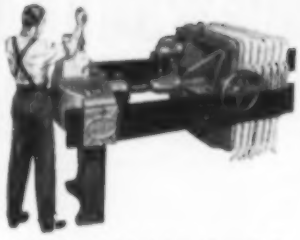
Available in five temperature ranges, either Fahrenheit or Centigrade.

Maximum accuracy is obtained because Polarized Plugs and Jacks are of thermocouple materials, eliminating errors produced by unmatched elements.

The coupling plug quickly connects the pyrometer to any of the six thermocouple jacks.

If you will advise us the details of your application, we will recommend suitable equipment or, for additional information request our Catalog Section 25 E

Thermo ELECTRIC CO. FAIR LAWN, N. J.



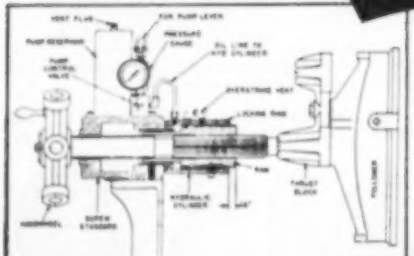
After the handwheel has advanced the screw into contact with the thrust block, a few strokes of the hand pump lever advance the hydraulic ram to assure absolute tightness of the press, as much as 60 tons closing pressure. All this takes but a minute. And opening the press is just as easy.

Save TIME LABOR

Avoid ACCIDENTS TROUBLE

in Filter Press Operation with the

HYDRO-KLOSER



Easy to install at moderate cost on any Shriver 24" or larger filter press, the Hydro-Kloser definitely ends the back-breaking job of manual closing, reducing possibility of accidents. It quickly pays for itself in shortened closing time, convenience, better labor satisfaction, faster filtering cycles. It makes your present manually closed filter press practically automatic. Write for Bulletin.

T. SHRIVER & COMPANY, Inc., 802 Hamilton St., Harrison, N. J.

News, cont. . .

Process potentials of centrifuges were explored by Charles M. Ambler of the Sharples Corp. He pointed out that in the soap industry the average processing time using gravity methods is in the neighborhood of five days. Using supercentrifuges producing 13,200 times the force of gravity, process time is reduced to two hours. On top of that, the plant is smaller, and the product better. Centrifuges find wide application in such other industries as the manufacture of caustic soda, sugar, moth crystals and insecticides.

General chairman of the AIChE's regional meeting in Houston was W. A. Cunningham of the University of Texas. Principal speaker at the banquet in the Crystal Ballroom of the Rice Hotel was W. V. Houston, president of Rice Institute.

AIC Honors Breyer, Who Call For Individual Responsibility

Individuals, and not organizations, are the sound and proved reliance of society in time of crisis, just as they are its historical foundation, said Frank G. Breyer, member of the New York metallurgical and chemical engineering firm of Singmaster & Breyer, in accepting honorary membership in the American Institute of Chemists conferred on him at a meeting of the Institute's New York Chapter at the Hotel Commodore.

Emphasizing the responsibility of the individual, especially a member of a profession, Breyer entered a strong plea that the rising generation of chemists and chemical engineers be ready to act as individuals when their time of crisis come. Organizations, according to Breyer, who referred to experiences of the depression years from 1929 to 1935, are slow to sense the approach of crises and even slower to act to meet them. Only as individuals can we mobilize quickly and effectively to meet emergencies, he said, adding that organizations can often take over after individuals have overcome the immediate emergency.

Lawrence H. Flett, of Allied Chemical & Dye Corp., national president of the Institute, made the presentation. Foster Dee Snell, of Foster D. Snell, Inc., past president of the Institute, introduced special guests and read congratulatory messages from Breyer's friends throughout the world. Martin Meyer, of Brooklyn College, chairman of the Institute's New York Chapter, presided.

Williams Haynes, of Stonington, Conn., spoke of the personal side of

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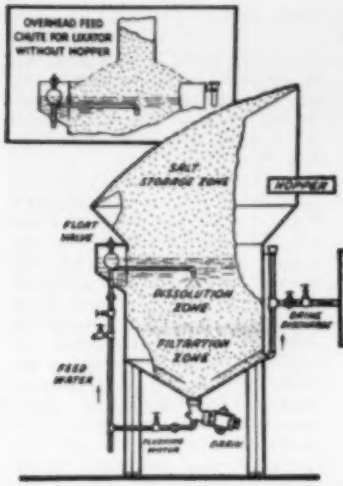
The LIXATE pipe line to efficient brine distribution



HOW THE LIXATOR WORKS

In the dissolution zone—Flowing through a bed of Sterling Rock Salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. In the filtration zone—through the use of the self-filtration principle originated by International, the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

Brine delivered by pipe to every point of use in your plant.

THE LIXATOR *automatically* provides 100% saturated crystal-clear, self-filtered brine that can be piped, by gravity or pump, anywhere . . . at any distance . . . it is needed in your plant.

JUST TURN A VALVE for Lixate Brine that meets the most exacting standards for chemical and bacterial purity . . . that can be diluted volumetrically to any desired strength.

THE LIXATE PROCESS for Making Brine cuts production costs as high as 20% . . . by cutting labor, time and waste in making brine. No hauling, measuring, stirring . . . YET ALWAYS a continuous supply of *accurately measured* brine.

Consult our Technical Service Department on your use of salt and brine. The experienced men on this staff will advise you on the proper location for Lixator and salt storage, pumping arrangements, types of pumps, meters, and valves. They will fit the *money-saving* Lixator into your plant operations. Write today!

NOW AVAILABLE

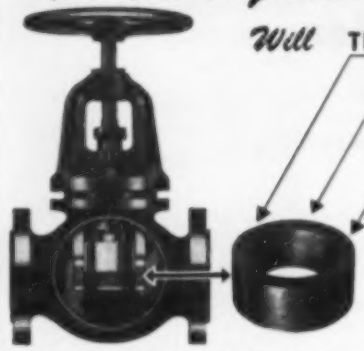
The New Stainless Steel
STERLING MODEL LIXATOR
For "Lifetime" Use
For Greater Economy
For Added Cleanliness

The **LIXATE** *Process*
REG. U. S. PAT. OFF.
for making brine
INTERNATIONAL SALT COMPANY, INC.
Scranton, Pa.

Strahman SEATLESS PISTON VALVES

The Valve You Should Know!

Will TEFLON
NEOPRENE
ASBESTOS
Hold Your Material?



The piston is shown entering the ring (partly closed) as a cork seals a bottle.

The Sealing Ring Makes Use of These and Other Materials to Fit Your Need

SEND FOR COMPLETE CATALOG

YOU SHOULD KNOW THE MANY FEATURES AND ADVANTAGES OF THE NEW STRAHMAN SEATLESS PISTON VALVE

KLINGERIT, Inc. • 16-22 Hudson Street, New York 13, N. Y.

A leading plant in the East brought us their filtering problem. The result: a custom-designed stainless steel filter with four especially designed interchangeable units.

Fabricating filter units of wire and cloth has been our "specialty" for over 35 years. Multi-Metal is equipped to handle the entire operation from wire cloth to final fabrication and assembling. On your next job we invite you to submit your requirements. Let us show you how our fabricating service can offer you short cuts to operating efficiency as well as economies through completely integrated fabrication — all within one plant.

More than 35 years of service to process industries

Multi-Metal
WIRE CLOTH COMPANY, INC.
1350 Garrison Ave., New York 59, N. Y.

Breyer, his youth in Baltimore, the development of his personality, his schooling at Johns Hopkins University, the important personal highlights of his career, and his family at Winsted, Conn.

J. A. Singmaster, Breyer's longtime associate and partner in Singmaster & Breyer, told of his professional and scientific accomplishments from the vantage point of 40 years of close personal and business association. He described their work together in organizing and leading the research division of the New Jersey Zinc Co. from 1910-1927. The results of this work ranged from standard analytical procedures and the birth of modern pigment microscopy to large-scale production of light-proof lithopone, mechanical furnace zinc oxide, vertical muffle spelter and the opening of a market for 225,000 tons annually of high-grade zinc in die castings.

With the formation of the consulting firm of Singmaster & Breyer in 1927, Singmaster continued, their interests widened to include delustered rayon, hot ink printing, and patent experting on sulphuric acid and lacquers, as highlights outside the fields of zinc and pigments. At the beginning of World War II, the firm assembled a considerable designing staff to engineer three magnesium plants to use a new process for recovering the light metal from dolomite. This organization has since undertaken pioneering jobs of designing and engineering from pharmaceuticals to fertilizers, from magnesium to uranium, from tin recovery in Bolivia to ammonia from wood in India.

New McGraw-Hill President Succeeds Brother in Office

New president and board chairman of the McGraw-Hill Publishing Co., Inc., is Curtis W. McGraw, formerly vice president and treasurer of the company. He succeeds his brother, James H. McGraw, Jr., who has resigned.

Curtis McGraw has been associated with the organization since 1920, when he started with the McGraw-Hill Book Co. In 1930, he became affiliated with the publishing company as a director and in 1943 was elected vice president and treasurer. He became vice chairman of the board in 1948.

During his years of service as chief executive officer, James H. McGraw, Jr., guided and directed the expansion of all phases of the company's operations in both the domestic and inter-

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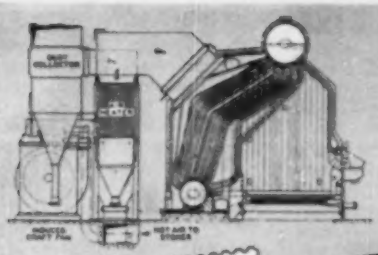


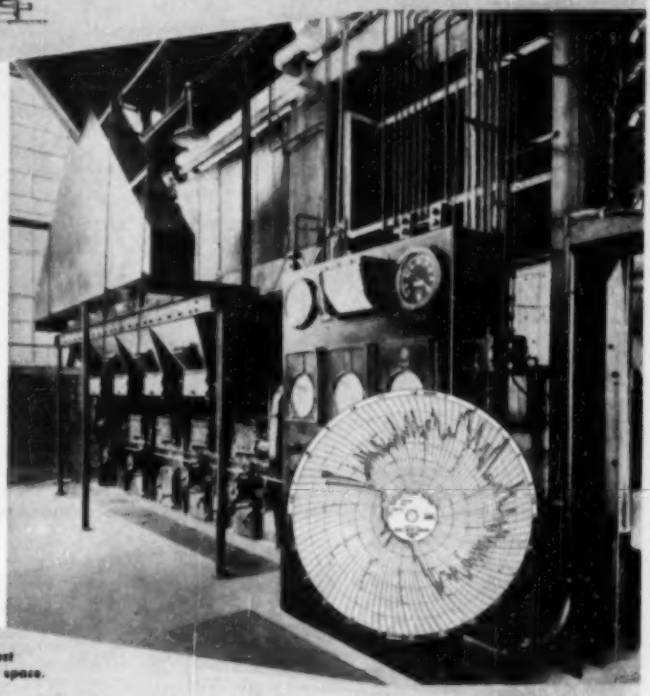
B&W Integral-Furnace Boiler, Type FF, at Hanes Dye and Finishing Company. Steam capacity is 40,000 lb. per hr. at 125 psi, with provision for future operation at 250 psi and with the addition of a superheater.

Another Example of B&W Engineering for Economy

...20% more steam

...37% less space

...20% fuel saving



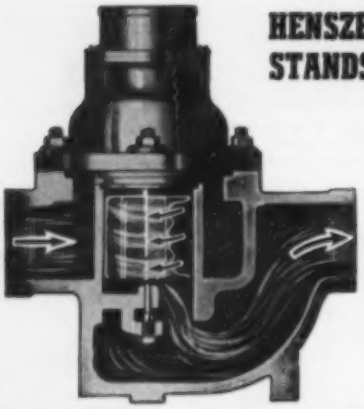
Compact, sing'e-level arrangement of boiler and auxiliary equipment with one-point control, provides utmost accessibility and ease of operation in minimum space.

Hanes Dye and Finishing Company, Winston-Salem, N. C., recently installed a single spreader-stoker-fired B&W Integral-Furnace Boiler, Type FF . . . in 37% less floor-space than was occupied by four existing units having 1/5 less total capacity. High efficiency is maintained over a wide range of coals, including low grades, resulting in estimated fuel savings of 20%. Operating over a daily load range of 12 to 1, the new boiler easily handles instantaneous load swings of 5 to 1 with close control of pressure and steady water level, as compared to pressure drops as much as 40 psi in the old units. Heavy maintenance costs experienced with the previous installation have been eliminated.

Dollars and cents benefits usually follow B&W's participation in boiler modernization for *any* type of plant. It will pay you, as it has so many other industrial, commercial, and institutional users, to investigate the modern B&W Integral-Furnace Boiler, Type FF, for steam capacities up to 60,000 lb. per hr. Start by writing for Bulletin G-64. The Babcock & Wilcox Company, 85 Liberty Street, New York 6, New York.

BABCOCK & WILCOX

G-663



HENSZEY *Feed Water* METER STANDS UP *where others* FAIL

The cutting, abrasive action of hot, dirty Boiler Blowdown quickly breaks down meters that depend upon close clearances and intricate arts for their accuracy. Henszey Meters stay accurate—stay on the job—accurately measuring Boiler Blowdown, Feed Water Condensate, FREE-RUNNING CHEMICALS and other "hard-to-measure" liquids. For details consult Sweet's Catalog or write:

HENSZEY CO., DEPT. E4, WATERTOWN, WISCONSIN

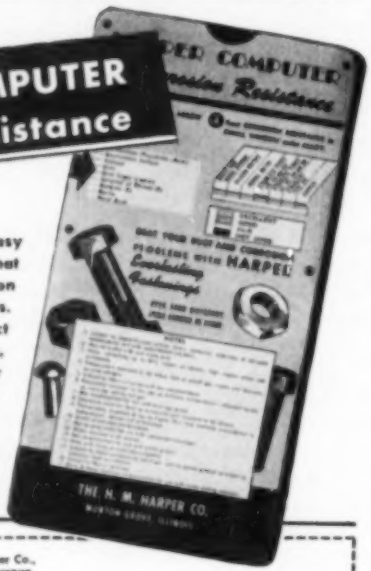
HENSZEY

FEED WATER METERS

Continuous Blowdown • Distillation Systems • Heat Exchangers
Boiler Feed Regulators • Flow Indicators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS

SEND FOR YOURS TODAY!

HARPER COMPUTER of corrosion resistance



Gives you a quick, easy method of determining what metal alloys to use in connection with 143 different corrosive agents. Ideal for metallurgists, product designers, engineers, chemists, purchasing agents. Sized to fit your pocket. Developed by The H. M. Harper Co., America's leading specialist in non-ferrous and stainless steel fastenings.

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8706 Lehigh Avenue
Morton Grove, Illinois

Please rush my free copy of the Harper Computer of Corrosion Resistance.

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Company.....
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national fields. He was associated with the company for 35 years and was its responsible executive for 20 years, since the retirement of his father, the late James H. McGraw, company founder.

Other McGraw-Hill executive changes include the appointment of Col. Willard Chevalier, formerly executive assistant to the president, to the office of executive vice president of the McGraw-Hill Publishing Co., Inc. He will also head up activities of the McGraw-Hill International Corp. Joseph A. Gerardi, with McGraw-Hill since 1929, first as attorney and later as vice president and secretary, was elected treasurer of the company, succeeding Curtis McGraw, the new chief executive.

Cold Rubber Now Produced By Continuous Process

Cold rubber of better quality and greater uniformity is being produced at the Port Neches, Tex., plant of B. F. Goodrich Chemical Co. by a manufacturing method that improves the efficiency of the process.

The method is one of continuous processing. It gives greater uniformity in quality of the longer-wearing cold rubber than was possible with the batch process heretofore used.

Operated for the government by Goodrich, the Port Neches plant is currently turning out cold rubber at a rate of about 30,000 tons annually. This is slightly more than half the plant's present total output.

The cold rubber production unit at the giant Port Neches plant has two series of 3,700-gal. reactor tanks, 12 tanks to the series. In the new continuous process, butadiene, styrene, water, soap, modifier and catalyst are pumped continuously into the first reactor tank, then into the second, and so on, right down the line to the twelfth reactor tank, at which time the butadiene and styrene have been polymerized to form cold rubber as a latex.

This latex, continuously discharged from the last reactor tank, is then pumped into other parts of the plant where it is coagulated, dried and made ready for shipment.

With this system it is easier to maintain stable 41-deg.-F. temperatures during polymerization.

When Goodrich used the batch processing technique, the principal ingredients of American-made rubber were pumped into each of the 12 reactor tanks in the production series. After mixing and polymerizing each

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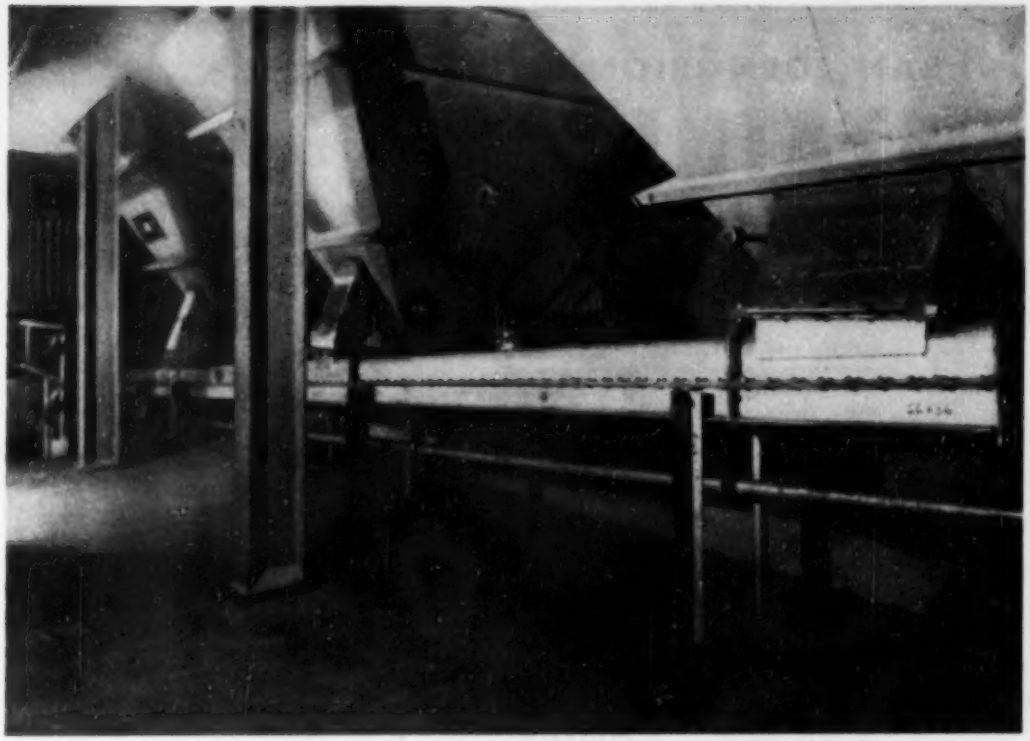

F-H AIRSLIDE . . . Conveys precipitator dust

We also build

Fuller-Kinyon Conveying Systems

For unloading and conveying dry pulverized materials from cars, ships and barges and delivering to storage; from storage to packer bins or process in the plant.

The Airveyor

For unloading and conveying dry pulverized and granular materials from cars, ships and barges to storage; reclaiming from storage for delivery to process in the plant.

Fuller-Fluxo Pump

For conveying dry pulverized materials; especially recommended for conveying extremely long distances.

Fuller Airlift

For elevating dry pulverized materials which have been placed in a semi-fluid state by aeration. Also used to deliver material at a constant rate, by weight, so as to maintain a constant head of material, if desired.

The F-H Airslide will convey many fine, dry materials, among which is hot precipitator dust. The photograph above illustrates the Airslide, installed in a cement plant, for conveying hot precipitator dust from three Cottrell precipitator hoppers. This installation replaced the screw conveyor shown directly below and back of the Airslide.

The installation has eliminated a dusty condition, noise, lubrication, and reduced power consumption to a minimum. Also, the possibility of breakdowns to the many mechanical parts used to drive a screw conveyor; possibility of the screw becoming jammed; hazardous moving parts. The Airslide is self-cleaning; simply stop the flow of material, allowing the air to continue to remove most of the residue in the conveyor.

We manufacture five distinct types of pneumatic conveyors. If you have a conveying problem, may we suggest that you allow us to make a study of your conditions, and recommend the type, or combination of types, best adapted to your requirements? There is no obligation on your part for this service.

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ENGINEERS IN PNEUMATIC CONVEYING

BAN CORROSION WITH

STAINLESS BIRTANKS

Stainless steel Birtanks are the best answer to the problem of corrosion in processing or storage. The unequalled resistance of stainless to attack, freedom from maintenance cost, and unlimited life make it far more economical in the long run.

Solid stainless and stainless clad steels are now obtainable and Birtank has the trained technical staff and ample facilities for fabricating vessels of any type or size.

Experienced engineering staff; early deliveries. Tell us your problems and write for quotations.

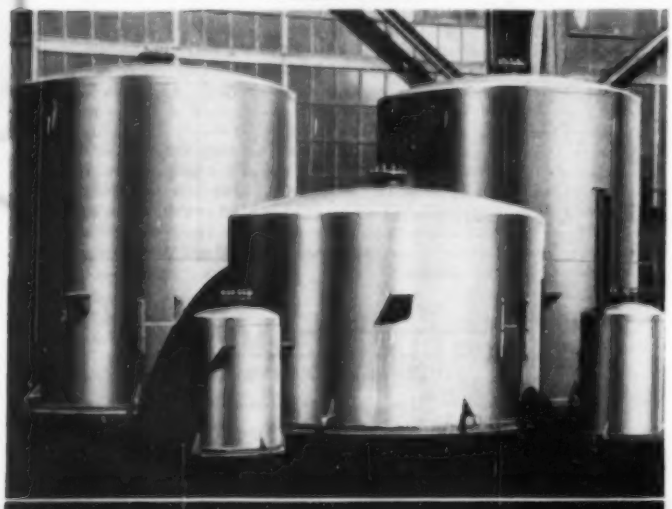
BIRMINGHAM TANK COMPANY

MAIN OFFICE: BIRMINGHAM, ALA.
Sales offices in New York, Chicago, Pittsburgh, New Orleans

THREE PLANTS
Birmingham, North Birmingham and Pascagoula, Miss.

AMINGALLS BIRTANK PRODUCT

Stainless steel pulping vessels, fabricated by Birtank for a leading soap manufacturer.



Specialists IN STAINLESS STEEL FABRICATION

batch would be discharged from the reactor into blowdown tanks for further processing. Each batch had to be laboratory-checked and temperatures had to be watched constantly for fluctuation. The continuous filling and emptying on an individual basis not only tied up manpower but was time-consuming. With the new method, these difficulties are eliminated by continuous processing.

Chemical Corps Drafted by Baltimore for Smog Survey

Baltimore city officials have called upon air pollution experts from the Army Chemical Center at Edgewood, Md., to help public health workers of Baltimore and adjacent counties survey the local smog problem.

Samples of smokestack gas given off by industrial plants will be obtained. Air at various locations throughout the area will be sampled.

Specialists from the Army Industrial Hygiene Laboratory and the Chemical Corps Technical Command and Medical Division at Edgewood will analyze air that may possibly be polluted, the Army says.

Reason the Army is making an air pollution survey of Baltimore and surrounding territory, according to the U. S. Public Health Service, is that USPHS is getting so many requests for surveys that it is forced to turn down most of them. Baltimore's request was turned down.

The PHS Industrial Hygiene Division, which made the Donora, Pa., survey, says that at least 25 cities have requested that air pollution surveys be made for them. The PHS is selecting those that are in "worse shape" than Baltimore because it hasn't the money and personnel to handle all the surveys. However, PHS plans to make surveys in Los Angeles, Louisville and Staten Island, N. Y. And it has asked Congress for a larger appropriation in the 1951 budget for air pollution work.

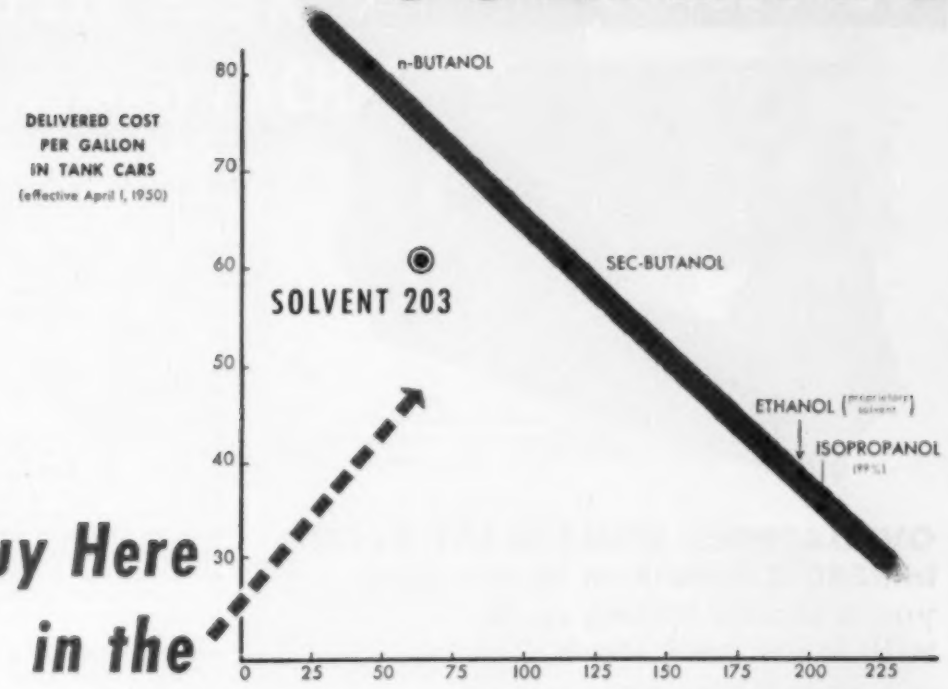
Meanwhile, the nation's top experts in air pollution are preparing to meet early in May in Washington in the first government-sponsored conference during which efforts will be made to pool knowledge and discuss problems.

Hydrocarbons Stored Below Ground in Natural Reservoirs

A new method of storing such volatile liquids as butane and propane below ground, instead of using the conventional above ground steel storage

(Continued)

SOLVENTS



Buy Here in the Area of Economy...

It is no longer necessary to pay premium prices for alcohol solvents in order to get the evaporation rate you require. Look at this chart. It shows the cost as a function of evaporation rate of five alcohols commonly used in nitrocellulose lacquers and other applications. Inside the curve—*in the area of economy*—you'll find Celanese Solvent 203 (a mixture of normal butanol and isobutanol.)

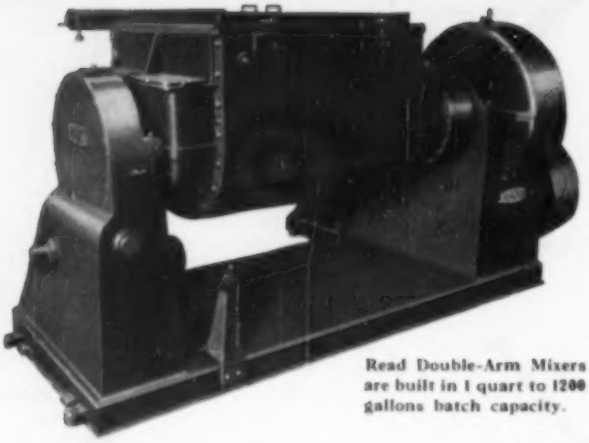
This solvent can give you savings well up to 14¢ per gallon, whether used singly or as a component in your formulation. Call or write for prices and other technical information. Celanese Corporation of America, Chemical Division, Dept. 53-D, 180 Madison Avenue, New York 16, N. Y.

Celanese® CHEMICALS

*Reg. U.S. Pat. Off.

ACIDS • ALCOHOLS • ALDEHYDES • GLYCOLS • INTERMEDIATES • KETONES • PLASTICIZERS • SOLVENTS

MIXING CYCLE *Speeded Up*
PEAK LOADS MINIMIZED



Read Double-Arm Mixers are built in 1 quart to 1200 gallons batch capacity.

OVERLAPPING SIGMA BLADE ACTION in READ Double-Arm Mixers gives you a *shorter mixing cycle* with *lower peak loads*

READCO CHEMICAL EQUIPMENT

Speeding up the mixing cycle and minimizing peak loads are definite advantages in batch mixers. Overlapping sigma blade action in *Read* Double-Arm Mixers does both. Formation of cylinders of material about the arms is avoided. They handle even the heaviest viscous materials with ease, smoothness, and production economy.

Some advantages: One-piece base to insure permanent alignment and rigidity—Mixing chamber accurately machined on double-arc bottom to insure close clearance with machined arms—Vacuum mixer has single packing gland construction to eliminate contamination or oxidation—Baffled jackets for even, efficient temperature control—Heavy-duty construction throughout—Available with or without jackets, of vacuum or non-vacuum design—Single, multi-speed, or variable speed motors for plastic processes.

Write Read for literature on Double Arm Mixers. If you have a mixing problem, let us offer you our advice.

READ

READ MACHINERY DIVISION
of The Standard Stoker Company, Inc.
YORK 1, PENNSYLVANIA

News, cont. . .

tanks, has been announced by a new company being formed in Kermit, Tex., under the name of Hydrocarbon Storage Co.

The process is said to reduce appreciably the cost of storage, as well as supply bombproof and fireproof storage. The method stores liquids and gases below the earth's surface in a natural reservoir where temperatures are low and constant. The reservoir is created by the usual drilling equipment.

Gulf Menhaden Co. recently completed its $1 million processing plant at Cameron, La. Over 750 persons are employed in processing more than 3 million fish per day. The oil is shipped for use in soaps, chemicals, vitamins, hair oils, paints and varnishes.

Barium & Chemicals Inc. will have its Willoughby, Ohio, plant, damaged by a $150,000 fire in May 1949, completely restored this spring. Temporary repairs, including a new roof, have enabled the plant to operate during the winter. No expansion of facilities is planned when the restoration gets under way, according to D. A. McCrory, who also reports that output of barium compounds will depend on general business conditions.

American Cyanamid Co. is bringing full-time medical service to employees at its Piney River, Va., plant and also to the members of the community of Piney River. Construction of a medical building is under way at the plant, and Cyanamid has engaged Dr. Erwin L. Hirsley, who will also establish a private practice. Hitherto residents of Piney River have had to travel long distances to get medical attention.

Dover Chemical Co., Dover, Ohio, will soon be turning out a refined chlorinated paraffin to be used as the fireproofing ingredient in a newly developed fireproof paint. Robert S. Cohen of Pittsburgh, Pa., heads up the new company. C. E. Wilson of W. C. Hardesty Inc. and Hardesty Chemical Co. will assist Cohen in an advisory capacity.

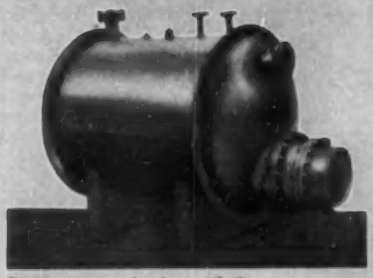
Pacific Tank & Industrial Coating Co. and W. S. Shamban & Co., both of Los Angeles, announce they are equipped to apply Teflon coatings on pipe, tanks, valves, rolls and other equipment where corrosion-resistant or non-wetting surfaces are required. At present only small-

(Continued)

PLATE FABRICATION AND HEAT EXCHANGERS

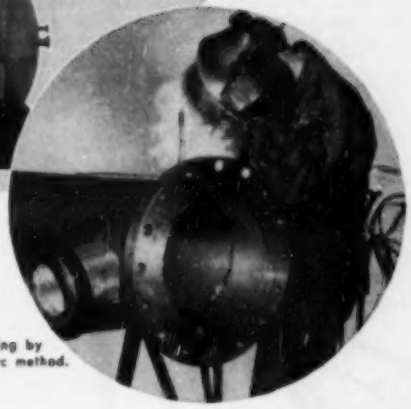
Jacketed Nickel Clad Agitator Pressure Kettle —5' 0" diameter and 8' 0" high.

Housing for high or variable voltage Electro-Static Generator— 5' 6" I.D. by 16' 8" high.



Storage type cooler for synthetic rubber plant . . . of Nickel Clad Steel.

This unit is of 304 Stainless Steel. 10' 0" O.D. by 28' 6" long overall. Weight — 15,000#.



Welding by Heliarc method.

SPECIALIZING IS OUR SPECIALTY

To fabricate work satisfactorily as above pictured, it is necessary to know proper welding procedures; the correct choice of welding electrodes for various types of metals; etc.

To accomplish this purpose, DOWNINGTOWN has pre-determined welding procedures (which are constantly checked and approved); a Welding Engineer, a Welding Supervisor, X-Ray and other technicians studying materials and methods.

Our experience and constant research in fabricating various grades of Carbon Steel, Stainless Steels, Nickel-Clad, Stainless-Clad, Monel-Clad, Cupro-Nickel, Aluminum, etc., may be of help to you. We are fully equipped with the most modern facilities to handle complete jobs, within our limitations, in the correct materials and methods of fabrication required to assure operating efficiency.

DOWNINGTOWN also maintains a Heat Transfer Division under the direction and supervision of men thoroughly trained and experienced in this field.

Engineering Consultation is at your service, to aid you in preparation of plans and/or specifications for definite jobs.

HEAT EXCHANGERS • WELDED AND RIVETED PRODUCTS

DOWNINGTOWN IRON WORKS • DOWNINGTOWN, PA.

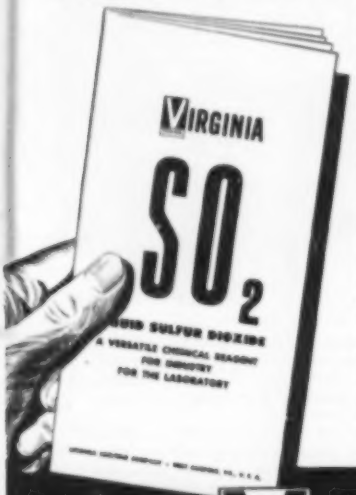
NEW YORK OFFICE, 30 CHURCH STREET

whiter, stronger, cheaper NEWSPRINT

Sulfur dioxide (SO_2) is a "must" in efficient, economical paper manufacture. To get best results from this chemical a new Southern industry selected "Virginia" to engineer the SO_2 storage facilities, staging and flow control devices in its newsprint mill, and to supply the liquid SO_2 used in process.

The "Virginia" SO_2 adjusts the pH and functions as a reducing medium, decolorizer, and antichlor. Result: SO_2 lifts whiteness several points and holds it against reversion; protects the quality and strength of the finished paper; saves maintenance costs on equipment.

This scores another big success for "Virginia's" 29 years of experience in applying its SO_2 to the specific and widely diversified needs of more than 40 industries. "Virginia's" seasoned chemists know intimately the SO_2 properties needed in this operation and how to develop them to best advantage. They also know what this fine SO_2 will do as a bleaching agent, neutralizer, or preservative—in cutting costs and improving production. Perhaps in *your* plant!



As the world's largest manufacturer of SO_2, we'd like to help you in realizing these objectives . . . in utilizing to the fullest "Virginia's" expert, technical know-how and the assured supply of SO_2 made possible by vast manufacturing and storage facilities, with specialized delivery equipment. If there is a likelihood that you can use our SO_2 and service to advantage, send for our SO_2 folder. VIRGINIA SMELTING COMPANY, Box 21, West Norfolk, Va.

Field Offices:
NEW YORK
BOSTON
PHILADELPHIA
DETROIT
CHICAGO
ATLANTA

VIRGINIA Chemicals

scale work is being done because of the limited supply of Teflon suspensoid. Shamban is engineering and sales representative for Pacific Tank.

Shell Chemical Corp. has opened a new technical service laboratory at Union, N. J. To be investigated there: uses for petrochemicals in protective coatings, hydraulic brake fluids and antifreezes.

Chipman Chemical Co.'s insecticide and weed killer manufacturing operations, now located on the north side of Houston, Tex., will be moved to a 12-acre site on the Houston Ship Channel near Pasadena. The proposed new $250,000 plant will increase manufacturing potential by 50 percent. Present plans call for completion of the plant before the end of the summer.

Plough, Inc., of Memphis, Tenn., manufacturer of pharmaceuticals, has authorized Wigton-Abbott Corp., engineers and contractors of Plainfield, N. J., to proceed with plans and specifications for the construction of a 150,000-sq. ft. addition to its Memphis plant. In addition, an existing one-story structure recently acquired by the drug firm will be remodeled. The new plant will house all research laboratories, manufacturing lines, printing and box manufacturing equipment, warehouse, shipping and office facilities now scattered in eight different locations throughout Memphis, in addition to a cafeteria.

Reilly Tar & Chemical Corp. is to build a coal-tar byproducts plant adjacent to Lone Star Steel Co.'s coke plant at Daingerfield, Tex. The plant will be jointly owned with the steel company. Construction starts immediately. —*End*

READERS' VIEWS AND COMMENTS

We Forgot

To the Editor:

Sir:—In your February issue (p. 67) you published comments on the acrylate field which we feel gave your readers incomplete and perhaps misleading information. Since we have long had a major interest in this field, we would like to give you the facts on the early development of the acrylates, and request that you publish this letter in your next issue.

(Continued)

VESSEL DIVISION

NEWS

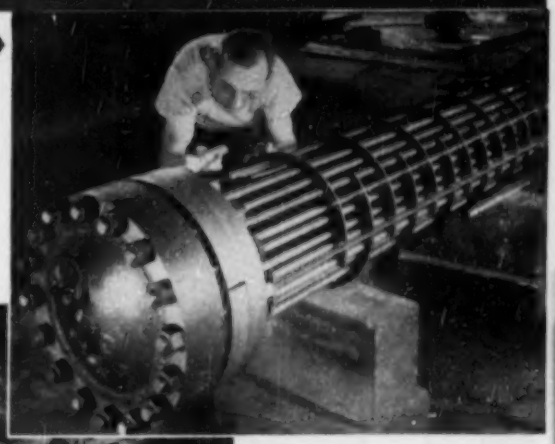
A.O. Smith 76th ANNIVERSARY 1874 - 1950

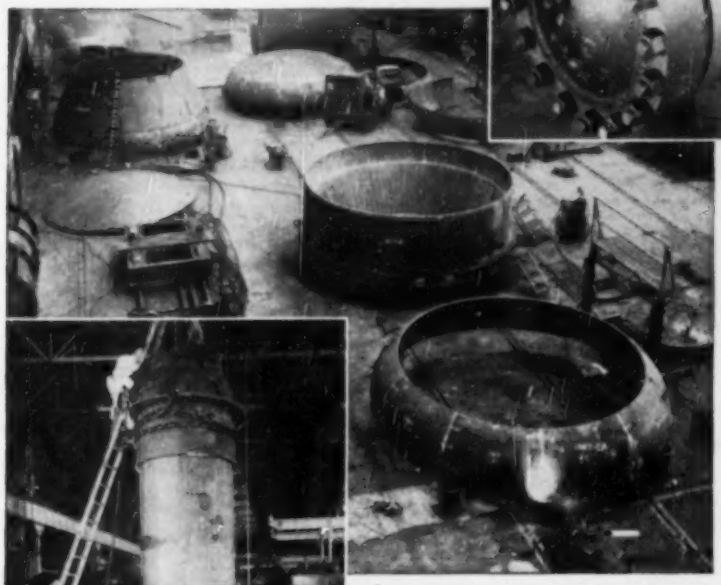
A.O.Smith

CORPORATION

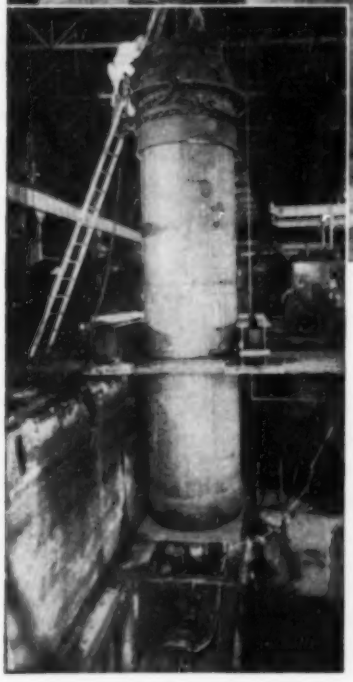
New York 17 • Philadelphia 3 • Pittsburgh 19 • Atlanta 3 • Chicago 4
Tulsa 3 • Dallas 1 • Houston 2 • Seattle 1 • Los Angeles 14
International Division: Milwaukee 1

HEAT EXCHANGERS FOR HIGHER PRESSURES. A. O. Smith solid-backing ring construction makes the split-ring floating head safe for higher pressures. Four exchangers, like the one shown here at the right, were built for one company and tested at 1875 lb. for a working pressure of 1250 lb.





SHIPPING LIMITATIONS, PLANT LOCATIONS, OR BUILDING CLEARANCES ARE NO BARRIERS. A. O. Smith can provide field-assembled vessels built and erected to shop-quality specifications. Shown at the left are part of the segmental cones and heads for six coke drums, to be field assembled. Each vessel will weigh approximately 220,000 lb. when completed.



MULTI-LAYER VESSEL CONSTRUCTION FOR HIGHER PRESSURES. This 24 ft. long by 4 ft. diameter Multi-Layer lined A. O. Smith Autoclave was given a running-in test in excess of the working pressure of 2,000 psi.

A. O. Smith Corporation, Dept. CE-450
Milwaukee 1, Wisconsin

Send the latest A. O. Smith Vessel Bulletins:

- ☐ V-46: Alloy, Alloy-lined, Clad, and Glass-lined Vessels
- ☐ V-44: Field Assembly of Pressure Vessels
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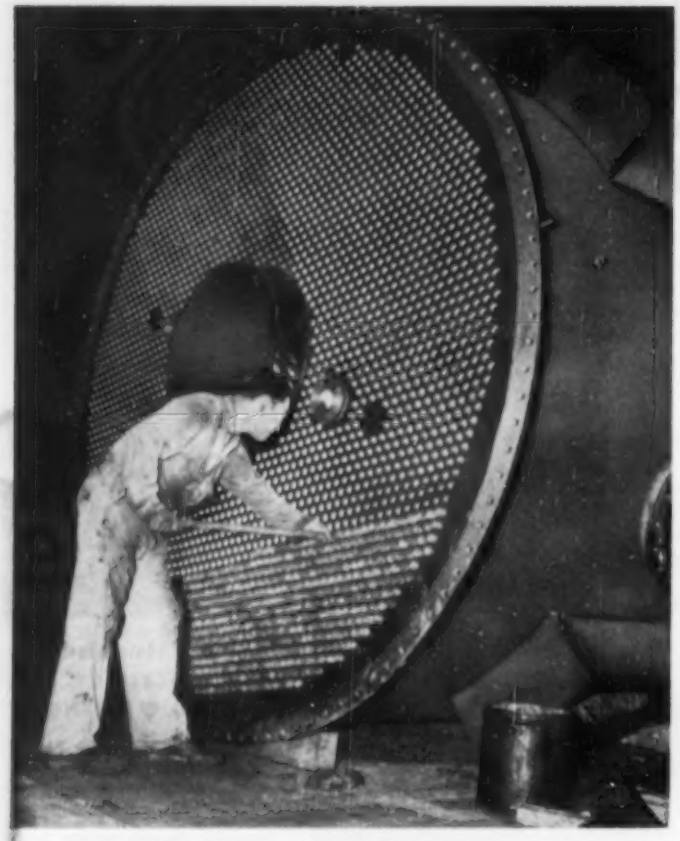
Firm _____

Street _____ City _____ State _____



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G-B's 67 years' experience in building chemical processing and other specialized equipment has instilled in our staff of engineers and workmen the know-how that results in lower costs of operation through high yields, high rate of efficiency, and long life.

We are skilled in designing and making all types of standard and specialized equipment—of routine or special materials of construction.

Call in the G-B engineers on your next job—a letter will bring one without obligation.

GOSLIN BIRMINGHAM MANUFACTURING CO., INC.

BIRMINGHAM 1, ALABAMA

NEW YORK Goslin-Birmingham, 350 Madison Ave.

CHICAGO F. M. deBeers and Associates, 20 N. Wacker

In 1901, Dr. Otto Rohm discussed in his thesis for his Ph.D. the polymerization products of acrylic acid. He continued working in the acrylate field in Germany, and in May 1929, his co-worker, Dr. Walter Bauer, filed a patent application resulting in U. S. Patent 1,829,208 covering the method of preparing acrylate esters which has been used for large scale production for many years.

In the spring of 1933 the Rohm & Haas Co., in its plant at Bristol, Pa., began producing methyl and ethyl acrylates in drum quantities. In the next several years these products were used in the manufacture of Plexigum, an interlayer for laminated glass, and in leather and textile finishes. Later developments have lead to the employment of these monomers for the production of polymers, both straight acrylate polymers and copolymers, used in a wide variety of applications.

Our first sales of the acrylate monomeric esters were made in 1936. Since that time, the market for ethyl and methyl acrylates has continually increased, reaching tank car proportions. Until 1949, the sole producer of the acrylate esters in the United States was the Rohm & Haas Co., in plants located at Bristol, Pa., and Knoxville, Tenn. Since their introduction, the prices of the acrylate monomers have varied from a high of $1.05 to a low of 45c. per lb. The present tank car prices are 48c. for the ethyl ester and 49c. for the methyl ester. Although our production has always been sufficient to supply our own needs and the requirements of outside purchasers, we are planning increased production facilities employing improved manufacturing processes. It is expected that this will enable us to reduce substantially the prices on these monomers and to expand greatly their usage.

D. S. FREDERICK

Vice President
Rohm & Haas Co.
Philadelphia, Pa.

NOTE: *What we said in a story of Carbide's entry into the field, ". . . ethyl acrylate, first of the monomeric lower acrylate esters produced in quantity." What we should have said, ". . . produced in quantity by Carbide." Our memory was embarrassingly short despite staff articles on Rohm & Haas operations at Knoxville (July 1948, pp. 98-101) and Houston (Feb. 1949, pp. 134-6). So we're pleased to have this fill-in on the present states of the acrylates—and the prospects for continued progress.*—EDITOR. —*End*

Penberthy Ejectors

(ASPIRATORS, EDUCTORS, EXHAUSTERS, MIXERS, ETC.)

Have Many Advantageous Uses in the Chemical and Process Industries

A simple jet pump operated by steam, water or air, the Penberthy Ejector has no moving parts and requires no lubrication. It is very unlikely to get out of order and wear is not appreciable. Other advantages of this jet type pump are that it is practically noiseless, very reliable, compact, convenient and has low initial cost.

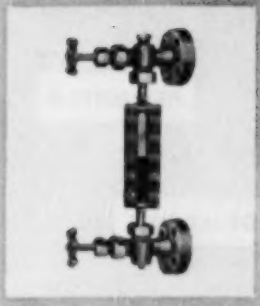
Widely used in the chemical and process industries, Penberthy Ejectors are made from ½" to 6" pipe sizes with screwed or flanged connections. They are made in bronze, iron and a wide variety of materials that successfully withstand corrosion, contamination and high temperatures. Special units are designed and manufactured to meet unusual conditions. Your inquiries are solicited. Write for Catalog 34.

PENBERTHY WATER HEATER

Penberthy XL-32 Water Heater (Open Tank Type) uses steam to heat water or other liquids to any temperature up to boiling (212° F) . . . quietly and without surging or pounding. Operating steam pressures range from 3 to 140 psi at the heater nozzle. Made of high grade bronze. Sizes are from ¼" to 2". Write us regarding special heaters for unusual conditions.

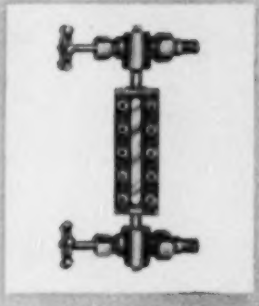
3949

PENBERTHY
REFLEX and TRANSPARENT
Liquid Level Gages



REFLEX

Due to "Reflex" principle, liquid always shows black and empty space white. Liquid level is indicated instantly and unmistakably. Made in any length desired of temperature resisting alloy steel for high pressure and temperature service. Conforms with API and ASME requirements. Ask for new Catalog 35.



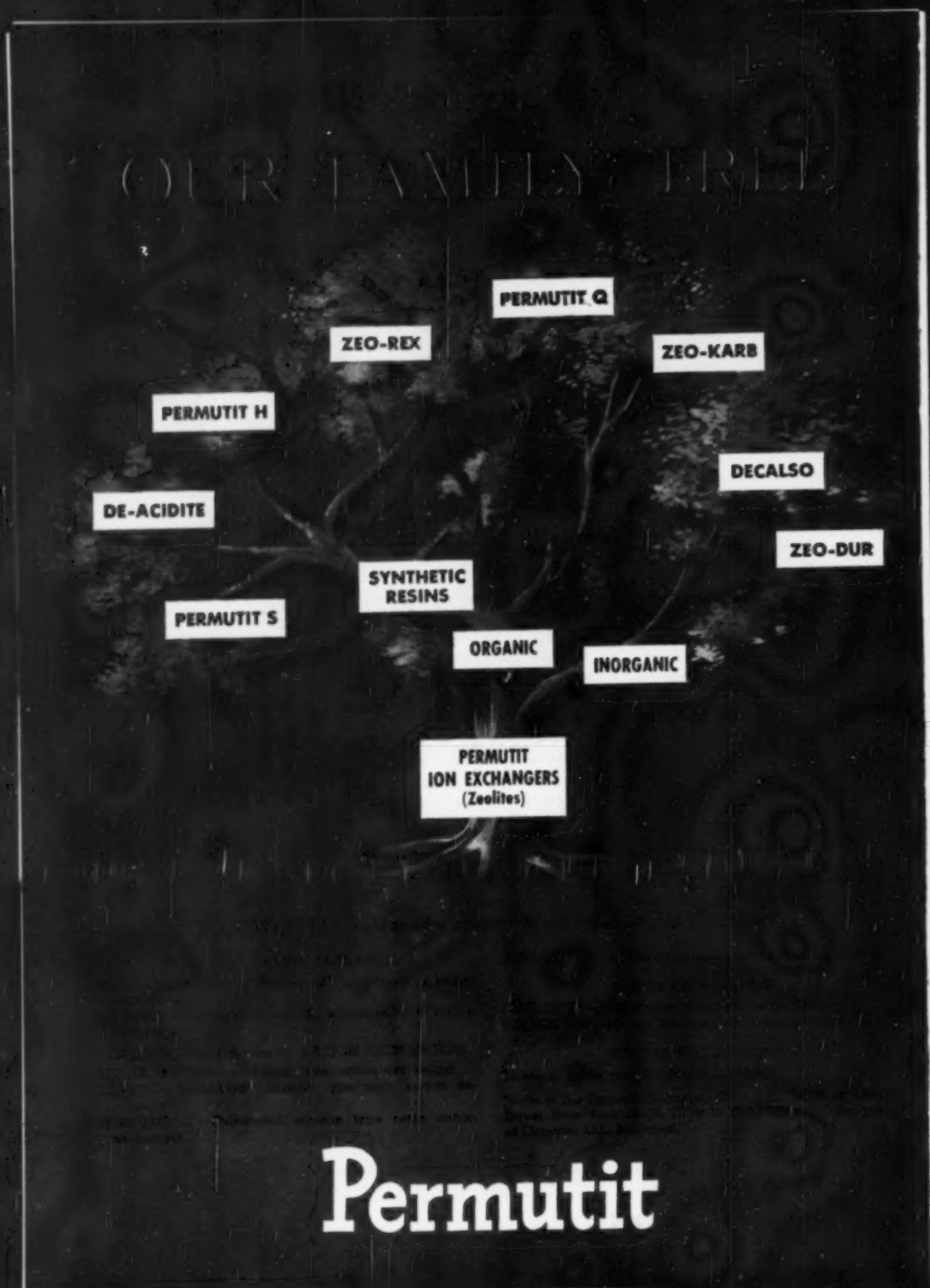
TRANSPARENT

Glass front and rear permits observation of color and density of liquids under high pressures and/or temperatures. Highest quality—made of temperature resisting alloy steel in any length required. Conforms with API and ASME requirements. Ask for new Catalog 35.

PENBERTHY INJECTOR COMPANY
DETROIT 2, MICHIGAN

Established 1896 — Canadian Plant, Windsor, Ontario

PENBERTHY PRODUCTS


OUR FAMILY TREE
PERMUTIT Q
ZEO-REX
ZEO-KARB
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DECALSO
DE-ACIDITE
ZEO-DUR
SYNTHETIC RESINS
PERMUTIT S
ORGANIC
INORGANIC
PERMUTIT ION EXCHANGERS (Zeolites)
Permutit

Men, Machines and Methods

ROGER WILLIAMS, Jr., Associate Editor

Area-Wide Pensions: Gosser's Hot Idea Might Cook Your Goose

Richard T. Gosser has had some 125 employers in a tizzy since last October. And starting last January 31 he has had the Toledo, Ohio, plant of the Plaskon Division of Libbey-Owens-Ford strikebound. The 500-man strike wasn't over as this was written.

The background of all this fracas is an idea Gosser came up with last October. Gosser is an international vice president of the United Auto Workers—CIO. His union had about 125 bargaining contracts in Northwest Ohio—and, like most unions, pensions were an issue at many of these plants. But, since some of the plants were small, the going was rough.

So, said Gosser, let's bind all 125 plants together into an areawide pension scheme. Gosser could see several advantages: uniform pensions despite plant size, uniform employer payments, the ability of a worker to shift jobs from one company to another and carry his pension with him, partial union control of a fund that could be huge.

As might be expected, the employers (mainly in Toledo) balked.

Here is what Gosser asked for: the 125 employers, normally employing about 50,000, would pay into a common fund enough money to pension employees having 25 years service at 65 with $100-a-month pensions including Social-Security payments). In addition, a welfare fund for hospital, medical and life insurance would be set up—this to be partly paid for by the employees.

That was all the detail Gosser gave in October. Employers reacted promptly with a "Committee to Save Toledo's Payrolls." This group claimed that the union demand would put Toledo's wage rates out of line with other parts of the country, would mean Toledo plants could not meet competition, would mean Toledo plants would have to shut down.

UAW's answer: sign up by Jan. 1, 1950, or be struck. (The De Vilbiss Co. got a further two-week ultimatum on October 20, refused, was not struck.)

January first came and went.

On January 19, Gosser submitted the details for his plan—in a 35-page pamphlet. (This did not mention an initial lump sum payment to start the fund, previously hinted.)

Gosser proposed: (1) the employer would pay eight cents an employee-payroll-hour into a pension trust fund, to be administered by an 11-man board (5 union representatives, 5 from the employers, 1 impartial paid administrative head); the employees would contribute nothing; (2) the employer would pay four cents per hour to finance the health security program; the employees would pay in about two and one-half cents an hour.

The pension fund would be handled by a bank or trust company, but with over-all supervision vested in the 11-man board. Pensions would be handled four ways:

1. Not less than $100 per month (including Social Security) for an employee at or over age 65 holding 25 years of credited service or more.

2. A monthly pension of $2.40 per month for each year of service for an employee of 65 or over having 10 or more, but less than 25, years service.

3. At or after age 60, and after 25 years of credited service, a pension which is the actuarial equivalent of a $60 pension at age 65.

4. To an employee with permanent or total disability and 25 years service, a monthly benefit of $60.

Credited service would be based on the worker's employment with any of the companies participating in the plan. Hence, years of service—and the resultant vested pension interest—would follow the employee as he shifted from job to job. In this the plan is like Federal Old Age Benefits (Social Security).

The welfare or health security program, to which employer and employee would contribute, would provide hospital insurance for the worker and his family, medical payments patterned fairly closely after the Veterans Administration fee schedule, disability and life insurance.

PLASKON STRIKE

Plaskon had been in this picture from the beginning. Manufacturing plastic molding materials, it may seem surprising that United Auto Workers was the bargaining agent, but it was. In the fall, when Gosser was picking the 15-or-so companies he would concentrate on, Plaskon was one of the companies.

Plaskon's contract with UAW had expired in June 1949, but negotiations had been postponed by mutual consent for many months. Finally, both sides had agreed on a Feb. 1, 1950, meeting. The strike intervened just one day before, on January 31.

The strike started on an early shift when five employees in the molding compound department allegedly refused, separately, to fill in for a worker who became ill. Says the union: the five were discharged, hence the strike. Says the company: the five were not discharged but were given indefinite disciplinary suspensions.

Since the strike started, the things that have been making the newspaper headlines have been contract provisions.

While officials of UAW Local 12, of which Plaskon employees are members, stated the strike was not fomented to secure the areawide pension program, a mass meeting of the strikers on February 2 adopted resolutions asserting "eventually the areawide pension plan has to be fought for." According to one of the local's officers, union negotiators have been instructed to "definitely bargain with the determination of ultimately accomplishing the local UAW's aim—the areawide pension plan."

Negotiations went on until February 14 and then were suspended until February 23. The issues, according to the union: (1) pensions, (2) removal of the 20-minute dressing periods, (3) removal of a 5c. premium for night shift work, (4) removal of premium pay for Saturday and Sunday work, and (5) management's desire to be able to rotate shifts. Said management:

1. Plaskon would offer $100-a-month pensions to employees at age 65 with 25 years service; $60 a month to those with 15 years. Disability would be included. But the plan

Announcing

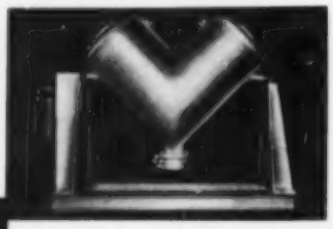
The NEW P-K Twin-Shell Blender*

...operating on an entirely *new* mixing principle

Unique in design — practical in operation, this blender provides a mixing action for dry materials unlike that of any other blender on the market. It combines an effective "split stream" action with a tumbling, rolling and folding movement, resulting in a smooth continuous mixing action. Blender capacities range from 1 to 300 cubic feet. Speeds range from 6 to 25 rpm. Mixing times vary with different products, of course, but are consistently shorter than with any other type of blender. Power requirements ¼ to 30 hp. Steel or allied materials.

smooth operation

The blending mass splits, rolls and folds during each revolution. No long drops or baffled falls. Will not break down delicate crystal shapes.

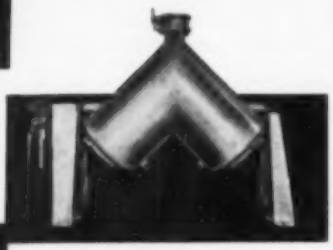


lower power consumption

Less power required; fewer revolutions to produce perfect blending.

faster mixing action

Resulting from novel "split stream" action coupled with rolling and folding.



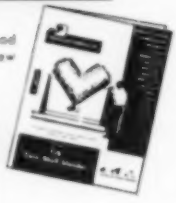
easily cleaned

Large access openings; all parts accessible; no baffles to catch and hold delicate particles and to contaminate the next batch.

test blends of your materials

Send us 8 quarts or more of each material. We'll make blending tests and report time required. You are welcome to visit our laboratory and see the tests made in our transparent plastic shell blender. Or, if you prefer, buy one of our 4 qt. or 8 qt. transparent laboratory blenders. Interchangeable. 1/20 hp 60 cycle, 120 volt motor.

Write on your company's letterhead for Catalog 401, describing the new P-K Twin-Shell Dry Blender.



the **Patterson-Kelley Co., Inc.**

23 Lackawanna Avenue • East Stroudsburg, Pa.

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would not be connected at all with other employers in the area.

2. Plaskon felt the dressing period represented portal-to-portal pay, and should be eliminated.

3. Difficulty on the night premium was just a case of contract wording.

4. Unlike automobile plants, a chemical plant like Plaskon could not work a 5-day week. Its continuous processes had to work 24 hours a day, 7 days a week. Hence the weekend premiums should be dropped.

5. Because of the continuous nature of the work, management should be able to rotate shifts.

Here are the details of Plaskon's pension proposal. In general, it is similar to many others in actual operation.

1. Pensions—As mentioned above, a pension of $100 a month for employees with 25 years service. If only 15 years' service, $60 a month. For any service record between 15 and 25, the proportionate pension between $60 and $100.

2. Disabled—Any employee with 15 years' service who is totally and permanently disabled will get a minimum of $50 per month, or 75 percent of the pension he would have received —whichever is greater.

3. Retirement—optional at age 65, mandatory at 68. The company must agree an employee is fit to work beyond 65 if he chooses not to retire.

4. Administration—Since the company would finance the plan, it would be managed by the company. Plaskon would report to its employees once a year on the benefits paid.

Since Plaskon's proposal, Gosser has backed down on his areawide scheme. The Toledo *Blade* quoted him at a mass meeting as saying, "It is the duty of every employer in the Toledo area to call in his shop committee and offer a pension plan of some kind, even if not on an area basis."

Whether or not Gosser will abandon his scheme, it is worth knowing about. Pensions are a relatively new thing for unions to be working on. In some cases they are groping their way. John L. Lewis tied the miners' to production, became magnanimous, ran out of money. Most of the others are tied to years of service. Here, for the first time, is one that does not tie an employee to any given company.

We have seen industry-wide wage structures grow—coupled with industry-wide bargaining. Perhaps Gosser's idea is a step toward areawide pensions and then areawide wages. If so, it is another step toward nationwide standard wages—something few, if any, employers look forward to with relish.

—*End*

1st in the Nation

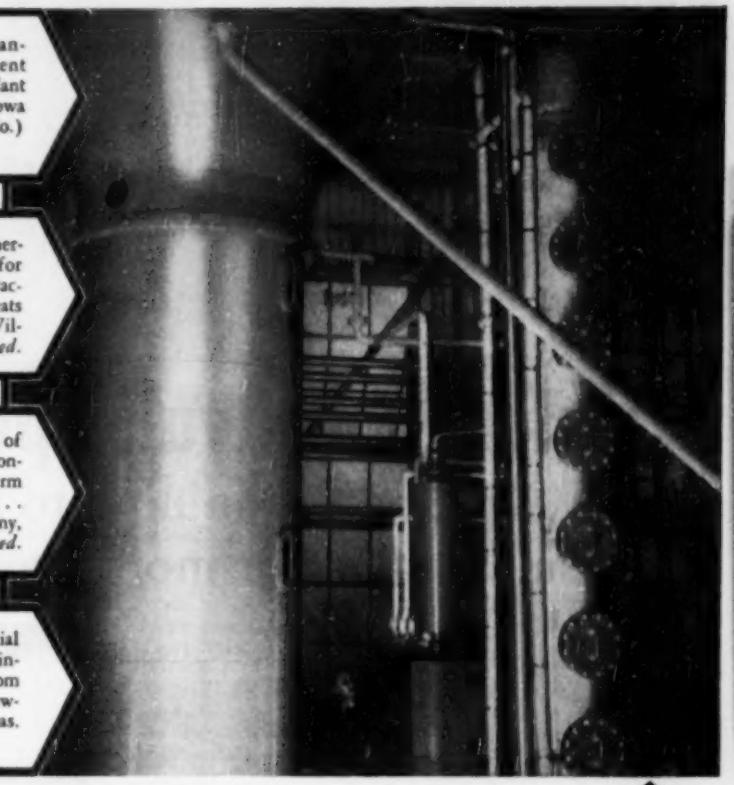
IN CONTINUOUS SOLVENT EXTRACTION

SOYBEANS First American-made continuous, counter-current soybean oil solvent extraction plant . . . Cargill, Inc., Cedar Rapids, Iowa (formerly Honeymead Products Co.) *Allis-Chalmers equipped.*

COTTONSEED First commercially successful unit in the world for direct and continuous solvent extraction of oil from cottonseed meats . . . Delta Products Company, Wilson, Ark. *Allis-Chalmers equipped.*

CORN GERM First unit of American design to extract oil continuously from prepressed corn germ by means of petroleum solvents . . . Corn Products Refining Company, Argo, Ill. *Allis-Chalmers equipped.*

RICE BRAN First commercial installation in the world for continuous solvent extraction of oil from rice bran . . . American Rice Growers Coop. Assn., Houston, Texas. *Allis-Chalmers equipped.*



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☐ Am interested in information on solvent extraction of _____
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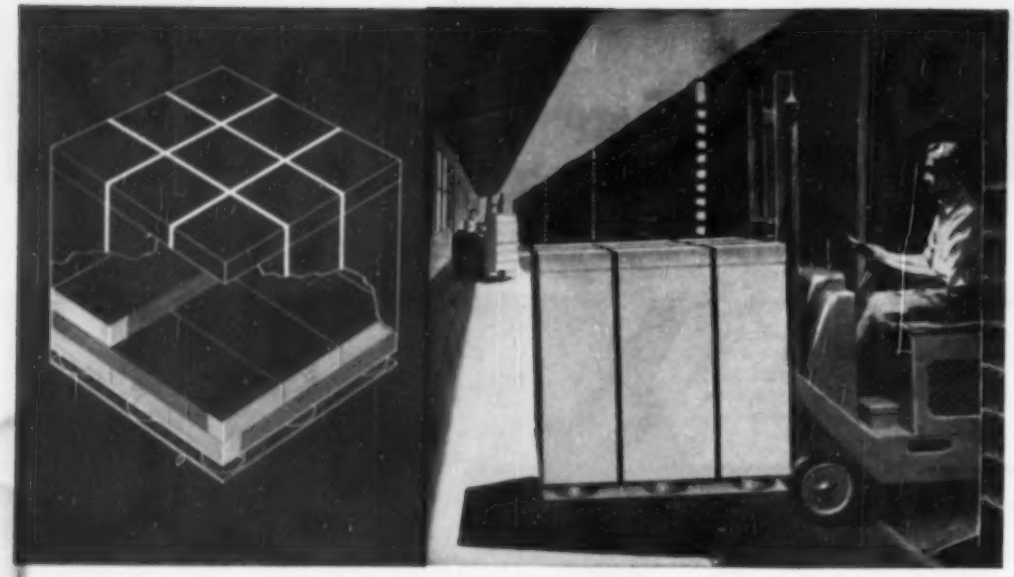

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Union Multiwall Specialist

will show you how to make Handling Labor more productive

ONE of the hidden costs in packaging is in the handling of packaging materials from unloading dock to warehouse to packaging assembly line.

Thanks to new ways of shipping and handling, many firms now find savings in handling costs alone more than justify a switch to Union Multiwall Bags. The Union Multiwall Specialist who calls on you, can tell you all about the recent cost-cutting developments in handling of multiwall bags.

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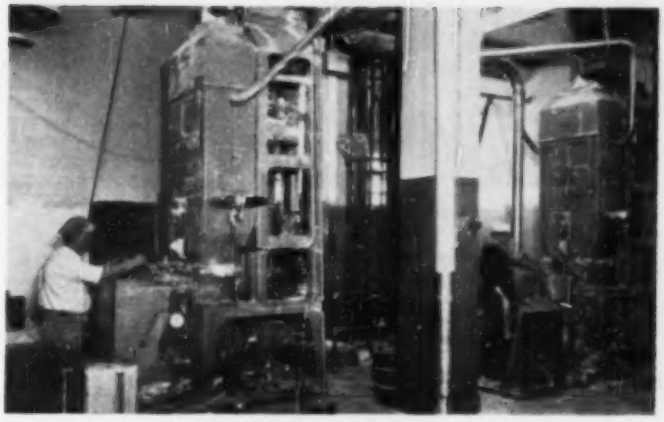

These screw-packers can fill more than 300 100-lb. bags per hour.

Packaging Notebook—VI

MULTIWALL BAGS

Many improvements in bag-loading equipment have broadened the use of these bags for chemicals.

Rapid increase in the use of multiwall paper shipping sacks for packing chemicals has been accompanied by many important improvements in the machinery used for packing these containers. Probably the most important development was that of the late A. M. Bates who not only conceived the idea of the valve bag also invented a machine to pack these "preclosed" sacks. His first machine was found to be highly efficient for packing cement and other rock products. The principles incorporated in his packer are essentially those in use today in the modern impeller valve bag packers.

This discovery by Bates also stimulated development of equipment for filling and closing open-mouth bags. The resulting improvements in scales, feeders, bag closing machinery, etc., along with the introduction of belt and screw type valve bag packers, over the last 25 years has provided a fairly wide diversity of equipment from which to choose. It is interesting to note that the use of multiwall paper shipping sacks has increased as better and more efficient bag filling and closing equipment has become available.

St. Regis Paper Co. for years has fabricated equipment for filling valve bags. They have impeller, belt and screw type machines which are equipped with either preweighing or gross-weighing scales. The accompanying table shows the available types with rates of filling.

The standard impeller type machine consists essentially of a continuously running shaft equipped with feeder blades which, mounted in a housing, force the material through the filling tube into the valve bag.

The other impeller type machines (horizontal and vertical shaft) are similar in principle, the differences being in the arrangement of the impeller blades and that the impeller shaft is started and stopped at the beginning and end of the filling cycle for each bag rather than turning continuously.

The belt type machines are used primarily for granular products and especially for crystalline products whose physical characteristics may be changed in passing through an impeller type machine. The packing principle is different. The material flows or is fed from a hopper over the packing machine through an inlet leading to a deep groove in a rotating pulley in which it is confined by an endless belt pressing against the outer flanges of the pulley. As the pulley rotates (at a peripheral speed of from 1,500 to 2,100 ft. per min.) the material is pressed against the belt by centrifugal force and is rapidly accelerated. After rotating through an arc of 90 deg., the material is discharged at a tangent to the pulley through the filling tube and into the bag.

On the two-tube gross-weighing machines of the belt type, a settler arrangement is provided to agitate the bag and settle the contents during a part of the filling cycle. On the preweighing machine of the belt type the settler provides such agitation during the complete filling cycle. Belt type machines are ordinarily equipped to pack 100-lb. bags, but special attachments are furnished for the filling of 25, 50, and 80-lb. bags as well.

The screw type valve bag filling machines are designed for packing lightweight finely ground materials such as flour and starch. Machines are made to handle the production of from two to six 100-lb. bags per minute with one operator. Low-production machines are equipped with an automatic timing device that stops the packing operation when the desired bag weight is reached. The high-production packers are constructed with two filling tubes and automatically weigh the product and pack it into the multiwall valve bag.

In addition to the several types of St. Regis packers described above, two west coast firms have been producing valve bag packers for the past few years.

1. The Stoker valve bag packer is a screw type machine. A counter balance on the scale beam operates a micro switch which cuts off the flow of material automatically. There is a ribbon-type agitator in the hopper to prevent bridging.

2. The Vredenburg Development Co. manufactures single and double tube valve bag packers. They are of the screw type equipped with machan-

FEON Nylon

FILTER CLOTH
Saves $9,000
A YEAR

A chemical manufacturer had been spending $1600.00 every eight weeks on heavy cotton filter cloth from which he obtained less than one week's life. Now using FEON Nylon filter cloth he gets a life of eight weeks and has reduced costs to only $200.00 for the same period—a saving of $9,000 per year!

FEON FITS *Your* FILTER

FEON synthetic filter cloths are made by Filtration Fabrics Division to fit all makes of vacuum and pressure filtration equipment. Since FEON is stronger and more resistant to abrasion and mechanical abuse, a lighter cloth (usually more efficient than a heavier cloth) can often be selected.

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Units like this St. Regis impeller-type loader weigh as they fill.

ical cutoffs actuated by movement of the scale beams. Bag settlers operate throughout 95 percent of the filling cycle.

There are a large number of packing machines which are designed for filling and closing open-mouth multiwall paper shipping sacks. They are designed for packing dry products having widely differing physical characteristics. The range of machinery extends all of the way from the fully automatic to the hand operated types.

For high speed fully automatic weighing, filling, and bag closing there is the Model A Bagpacker marketed by International Paper Co. It is designed to pre-weigh, drop the charge into the bag, and close the bag by sewing. Tape is applied automatically over the sewn closure using rubber latex or other types of adhesive. Two or three Hoepner automatic bucket type scales are used depending on the production speed required. The machine is operated with one attendant at packing speeds of over 1,000 bags of 100 lb. per hr. capacity.

The equipment has a revolving turret around the periphery of which the bags are carried on individual spouts. After the charge is dropped into the bag it is settled by jogging. Automatic bag-gripping carrier chains then remove the bags from the spout and guide them through the sewing head and then through the taping mechanism.

In installations where the high packing rates are not required, the use of automatic pre-weighing scales in combination with bag sewing units synchronized to conveyors have proved very satisfactory. Both the Richardson and the Hoepner scales operate efficiently for many chemical products. They are operated with auto-

(Continued)

Where valve-bag packers are used

Type	Typical Products	Type Scale	Weight of Package, lb.	Approx. Production, One Operator, Tons per Hr.*
Standard impeller packer	Cement	Gross weighed	94	15-70
	Lime	Gross weighed	50	
	Limestone	Gross weighed	80-100	
	Plaster	Gross weighed	80-100	
Vertical impeller-shaft packer	Talc	Gross weighed	100	10-15
	Clay	Gross weighed	100	
	Bicarbonate of soda	Gross weighed	100	
Belt packer (Single tube) (301-FG)	Bicarbonate of soda	Gross weighed	100	10-20
	Trisodium phosphate	Gross weighed	100	
	Flake graphite	Gross weighed	100	
	Granular soda ash	Gross weighed	100	
	Chicken grits	Gross weighed	100	
Belt packer (1-tube) (301-PB)	Dog food	Preweighed	25-100	9-15
Belt packer (2-tube) (160-PB)	Fertilizer	Gross weighed	25-100	20-40
Belt packer (2-tube) (152-PB)	Calcium chloride	Preweighed	100	15-25 on 100 lb. two tube
	Sugar	Preweighed	25-100	
	Salt	Preweighed	25-100	
	Charcoal	Preweighed	25-100	
	Alum	Preweighed	25-100	
Screw packer (2-tube) (402-PB)	Flour	Preweighed	100	12-18
	Calcimine	Preweighed	100	
	Starch	Preweighed	100	
Screw packer (1-tube)	Flour	Gross and Preweighed	25-100	3- 9
	Starch			

* Production varies, depending on type of installation, size of bags being packed, physical properties of product, etc.

Homestead
LEVER-SEALD
Valves

ALWAYS WORK
LAST LONGER
COST LESS PER YEAR

STICKING valves are never a problem with Homestead Lever-Sealds on the job. Built into each valve is a powerful leverage, ready at all times to overcome the effects of corrosion, viscous fluids or temperature and pressure extremes which cause ordinary valves to stick or "freeze."

This powerful leverage not only relieves pressure between the seating surfaces to permit operation under all conditions; but it also is the means of providing the extra tight seal against leakage—the seal which keeps corrosive or erosive line fluids away from the seating surfaces; assures longer valve life and lowest cost per year.

Made in stainless steel, steel, semi-steel, bronze, monel or other alloys suitable for the working conditions under which they are to be used, Homestead Lever-Seald Valves may be had in sizes from 1" to 12"; and for working pressures from 150 pounds to 1500 pounds.

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Check these Outstanding Features:

A QUARTER-TURN fully opens or closes valve.

INSTANT STICK-PROOF OPERATION. Plug turns freely after seating pressure is relieved by screw lever.

POSITIVE LEAKLESS SEAL is obtained by applying full seating pressure with screw lever after opening or closing.

LEAK PROOF. Deep stuffing box, gland and sealed bottom prevent fluid loss, and reduce hazards.

STRAIGHT-LINE FLUID FLOW. Little or no pressure drop.

SEATING SURFACES ALWAYS PROTECTED in both open and closed positions. Fluid or grit cannot damage valve seat.

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SCREW PUMPS
solve the toughest
Pumping Problems!

Take a tough, sticky pumping problem — add powerful Sier-Bath Screw Pumps—and you've got the recipe for a smooth-flowing operation! Simple design (only two moving parts), and sturdy but accurate construction are Sier-Bath's formula for efficient, low cost moving of viscous materials.

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Pumps: acetates, asphalts, brines, Bunker C fuel oil, cellulosics, greases, molasses, syrups, etc. Pressures up to 1000 lbs.

These Features Cut Maintenance Costs:

1—*No metallic contact between rotors* sustains high volumetric efficiency, even when handling non-lubricating liquids.

2—*High volumetric efficiency* reduces wear caused by erosion.

3—*Axial Flow from ends to center* eliminates thrust bearings, high radial loads, pulsation, vibration.

4—*Only suction pressure on stuffing box*—packing can be added while pump is running.

5—*Heavy duty service* from husky shafts, sturdy rotors, high load capacity bearings, and deep stuffing boxes.

Available in horizontal or vertical construction—special alloys, jacketed bodies to meet individual requirements. Write for booklet.

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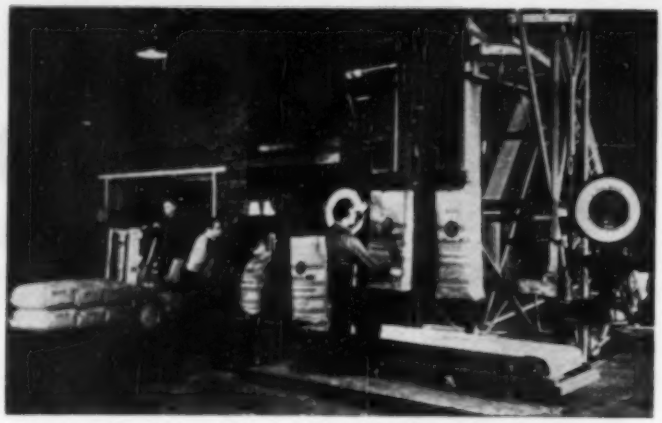
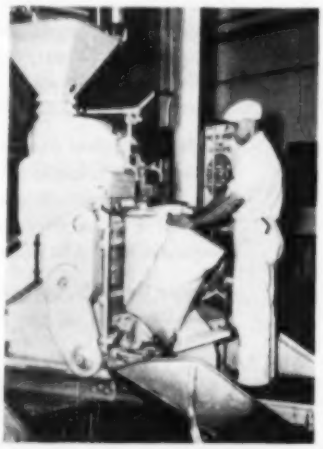


Union Bag & Paper's new ram-type packer is used to load rock wool.

hand pull. Filled bags are dropped onto the conveyor of the sewing unit. Sometimes bags from two scales are fed into one closing unit. Packing speeds are from one to twelve 100 lb. bags per minute.

The Richardson Scale Co. has a bag settling device called an oscillating packer. It agitates the bag by oscillating the bag packer during the packing operation. It retracts so that the filled bag can be dropped onto the conveyor.

If automatic scales are not required, bags can be hand weighed. A hand operated filling gate at the bottom of the bag hopper regulates the flow of material into the container. Bags are hung from scales or are filled to an approximate weight and then transferred to a platform scale where weights are adjusted. The most efficient type of weighing scale is the "over and under" type. Filling with this type of equipment can be conducted at a rate of three to six bags of 100 lb. capacity per minute. The scales can be floor-mounted, swing-mounted, or suspended.



Belt-type loaders speed filling.

It is important that the proper type of bag holder be used to secure the container to the hopper outlet during filling. Tops of open-mouth bags which are to be closed by sewing should not be deformed. The most desirable type is oval in shape and so designed that both gussets of the bag are kept folded. This will greatly facilitate the sewing.

Where filling and weighing facilities are available, bag sewing machines mounted on slot or belt type conveyors are usually used for closing these multiwall sacks. The speed of the conveyor is synchronized with the speed of the sewing head. The heavy duty sewing heads, mounted over the conveyor, are adjustable vertically to accommodate various bag heights. The sewing heads can be equipped with taping devices and automatic tape cutters. Some apply the tape and then sew through the bag and tape. Others sew through the bag and then adhesive tape is applied over the stitching. If bags are to be moved from the closing equipment by hand truck it is more efficient to use a short length of elevator conveyor to carry the bags to waist height. In sewing operation, the bag is guided by hand through the sewing head.

The Union Bag & Paper Corp. recently announced a special ram type packer for rock wool. The machine is of twin construction to permit continuous operation. Airtight seals on duckbill type hopper spouts prevent dusting. Motion of the duckbill is controlled by air pressure which is operated by a foot valve. The ram is operated pneumatically and packs

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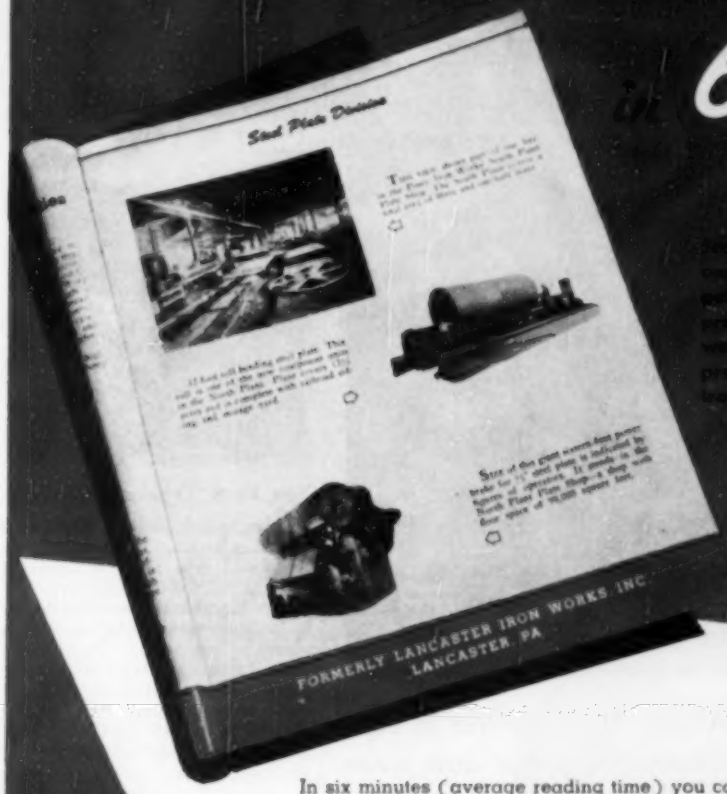
How you may CUT steel plate construction COSTS



In six minutes (average reading time) you can review the Steel Plate section of Posey Iron's new 12-page reference bulletin. In those six minutes, you may learn of production facilities that can be used to cut your steel plate fabrication costs . . . products that may effect processing economies in your plant.

Among the "specialties" on which Posey Iron estimates are often low for work of high integrity you'll find elevated tanks . . . gas storage tanks . . . pipe (including dredge) . . . pressure vessels . . . stacks . . . stills . . . and digesters. Posey Iron is equipped to do the complete job from (1) design to (2) fabrication to (3) erection.

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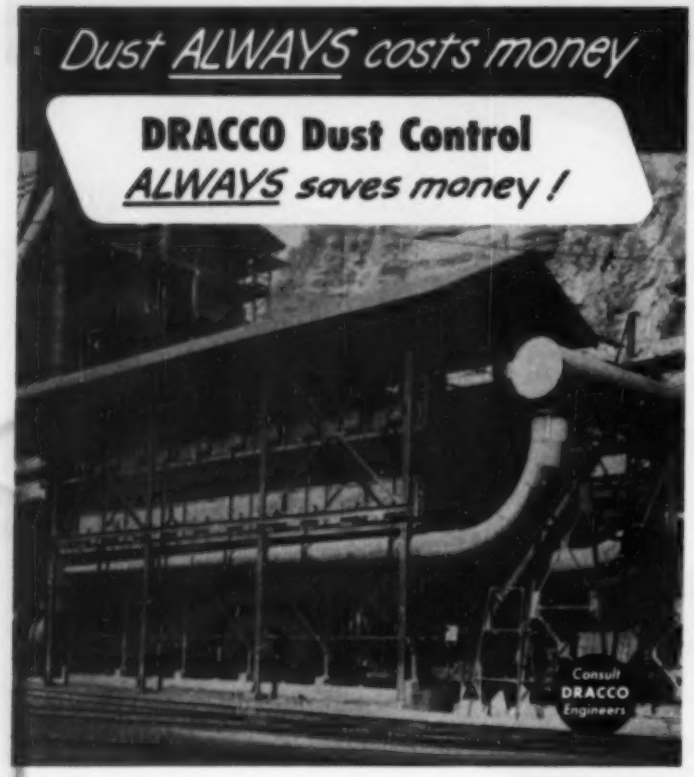

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DUST CONTROL EQUIPMENT

PNEUMATIC CONVEYORS • METAL FABRICATION

(with some compression) pre-weighed quantities of material to a pre-determined height in the bags.

As bag filling conditions vary greatly each packaging problem must be studied and the many variations in production and product characteristics require a consideration of the facts in each case before equipment can be chosen.

New Fork Trucks by Baker

Baker Industrial Truck Division of the Baker-Raulang Co., Cleveland, has announced new fork lift trucks of 3,000 lb. and 4,000 lb. capacity.

The lift and tilt mechanisms are hydraulically operated by low pressure systems. Operators have unobstructed views due to the design of the dash panels. A mechanical interlock prevents reversing except with the accelerator in neutral. An electric interlock with the brake and seat provides dead man control.

ICC Changes Affect Shipping Rules for Chemicals

The ICC amended their regulations for the transportation of explosives and other dangerous articles on January 23rd. Adoption of these changes become mandatory on April 23, 1950 but are optional prior to that date. Those of interest to the chemical industry are summarized below. For complete details the Order should be consulted.

1. SEC. 81g NOTE 2: PETROLEUM ALKYLATE, ISOPENTANE, AND OTHER INFLAMMABLE LIQUIDS HAVING V. P. NOT EXCEEDING 40 LB. PER SQ. IN. ABSOLUTE AT 100 F. The emergency authorization for transporting these inflammables in Spec. ARA—IV and ICC 104 tank cars will be cancelled May 1, 1950.

2. SEC. 108(h) ETHYL CHLORIDE—Permission to ship in tank motor vehicles MC-300, MC-301, MC-302 or MC-303 has been cancelled.

3. Sec. 109(f) (h) ETHYLENE OXIDE—Tank cars Spec. 104A, 104A-W, or ARA-IVA are authorized for shipping this compound. All cars not complying with these specifications and previously authorized for shipment have been cancelled. Permission to ship in tank motor vehicles Spec. MC-300, MC-301, MC-302, or MC-303 has also been cancelled.

4. SEC. 188(e) PHOSPHORIC ANHY-

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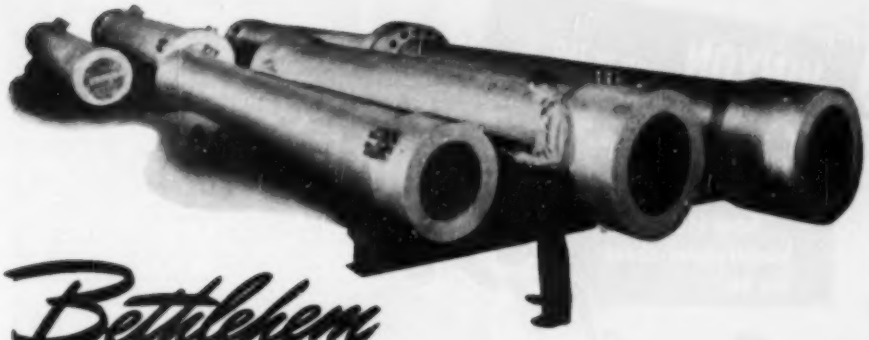

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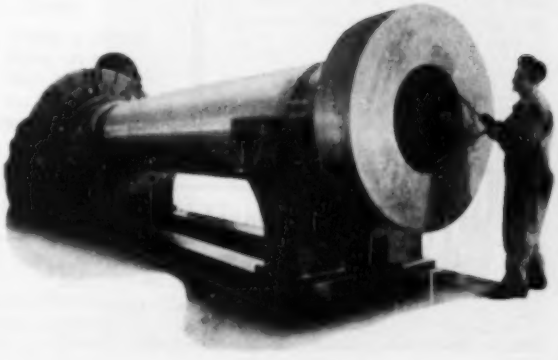
FORGED STEEL PRESSURE VESSELS

Any Type . . . Any Size . . . to Your Specifications

Bethlehem is unusually well equipped to build the forged steel pressure vessels you have in mind. It's a complete, down-the-line service at Bethlehem—a service that includes everything from the first steps of engineering to the last, careful testing of the finished vessel.

We build, of course, to your specifications, using the carbon or alloy steel you choose. Units can be of single or multiple type, in virtually any size. Our shops produce some very, very large ones and some that are, by comparison, almost tiny. All are seamless, all have the rugged strength that assures many years of reliable operation.

Next time you're planning forged vessels, ask a Bethlehem man to sit in. He'll be glad to explain what Bethlehem has to offer, and show you what we have done and are doing for others.



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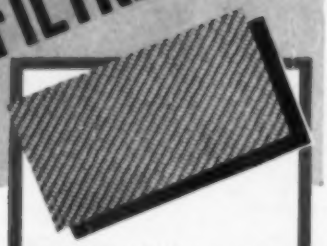
Tops for broad-range CHEMICAL FILTRATION



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Over Forty Years of weaving experience have given us the "know how" so necessary to the production of top quality Industrial Filtering Fabrics. We weave all of our Synthetic Fiber Cloth including Glass, Nylon, ORLON* (an acrylic fiber cloth), Saran, VINYON†, and VINYON N†.

Write us about your requirements, we'll be glad to send test cloths, if you are not sure which cloth material is best.

*TM — E. I. duPont de Nemours
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"Excellent Resistance—No Attack" are the operating reports when these filter cloths are used for filtering:

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CAUSTICS

SODIUM HYDROXIDE
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PACKAGING, cont. . .

DRIDE. Spec. 6K metal drums have been added to the authorized list of containers for transporting phosphoric anhydride. These containers may be used only for carload or truckload shipments when loaded by shipper and unloaded by consignee. Each drum must be air tested for leakage at not less than 7 psi. before each refilling.

5. SEC. 206(a), (2) SODIUM OR POTASSIUM METALLIC, LITHIUM METAL, LITHIUM SILICATE, AND LITHIUM HYDRIDE may now be shipped in Spec. 15A or 15B wooden boxes with inside welded metal containers closed with air tight pipe fittings of screw thread type. Containers are to be adequately cushioned and blocked in the outside container so closures cannot come in contact with outside container. This authorization is in addition to the inside containers (soldered metal cans) previously authorized.

6. SEC. 249(k) ALKALINE CORROSIVE LIQUIDS n. o. s., ALKALINE CAUSTIC LIQUIDS n. o. s. AND ALKALINE BATTERY FLUIDS. Inside glass bottles may not be used in Spec. 12B fiberboard boxes for transporting these corrosives. Bottles made of polythylene or other resistant materials other than glass are approved.

7. SEC. 262(f) HYDROBROMIC ACID may be shipped in Spec. 103B tank cars in addition to previously authorized containers.

8. SEC. 303(k) COMPRESSED GASES PACKED IN CYLINDERS. DIMETHYLAMINE, ANHYDROUS and TRIMETHYLAMINE ANHYDROUS may be shipped in the following specification cylinders when packed to a maximum filling density of 59 percent for the former and 57 percent for the latter compounds: ICC—3A 150; ICC—3B 150; ICC—4B 150; and ICC—4B 150. The maximum filling density for MONOMETHYLAMINE ANHYDROUS has been increased to 60 percent. The approved list of specification cylinders for packing the product has been changed to the following: ICC—3A 150; ICC—3B 150; ICC—4B 150; and ICC—4BA 150.

9. SEC. 303(q) (1) COMPRESSED GASES TRANSPORTED IN TANK CARS. DIMETHYLAMINE ANHYDROUS may be shipped in Spec. 106A500 tank cars when filled to a maximum filling density of not over 59 percent and in Spec. 105A300 tank cars filled to a maximum filling density of not over 62 percent. MONOMETHYLAMINE ANHYDROUS may be shipped in Spec. 106A500 tank cars filled to a maximum filling density of 60 percent and in Spec. 105A300 tank cars filled to a maximum filling density of 62 percent. TRIMETHYLAMINE ANHYDROUS may be shipped in Spec. 106A500 tank cars filled to a maximum filling density of 57 percent and in Spec. 105A300 tank cars filled to a maximum filling density of 59 percent. Authorization to ship NONLIQUEFIED HYDROCARBON GAS in Spec. 107A tank cars has been cancelled.

10. SEC. 256(f) PHENOL. Permission has been granted to increase maximum net weight packed in Spec. 17T and 17H single trip metal drums from 450 to 475 lb.

11. SPEC. 5B(7) STEEL DRUMS. Returnable steel drums of not over 15 gal. capacity may be fabricated from not less than 26 ga. steel. Formerly, drums of capacities over 10 gal. and not more than 23 gal. were required to be fabricated of not less than 18 ga. steel.

12. SPEC. 5C(6) STAINLESS STEEL DRUMS. The types of stainless steel authorized for use in drums for transporting nitric acid of various strengths is as follows: Type 304 or other grades of equivalent corrosion resistant steels in the as-welded condition are permissible for nitric acid concentrations up to and including 78 percent. For all concentrations of nitric acid the following are permissible: (1) Type 304 heat-treated (quenches from 1,900 F.) or (2) Stabilized Type 347 in the as-welded condition or (3) Stabilized Type 347 stress-relieved (1,550-1,650 F.) or (4) Stabilized Type 347 heat-treated (quenched from 1,950 F.) or (5) Other grades of equivalent corrosion resistance.

13. SPEC. 6K STEEL DRUM FOR TRANSPORTING PHOSPHORIC ANHYDRIDE. This new drum specification provides for a container of not over 55 gal. capacity fabricated of 16 ga. steel. (see above.)

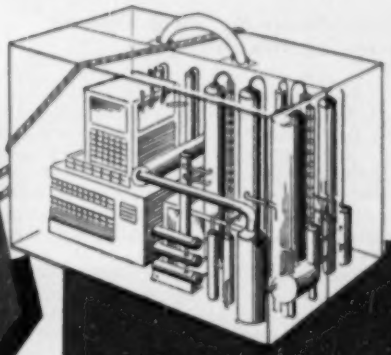
14. SPEC. MC 330 STEEL CARGO TANK. This new specification for a truck tank is designed for compressed gases. It is expected that future Orders will authorize transportation of such gases as anhydrous ammonia, carbon dioxide, liquefied petroleum gas, nitrous oxide, and sulphur dioxide. —End

Wigton-Abbott Corporation

builds COMPLETE PLANTS*

"PACKAGED PLANT CONSTRUCTION"

a Complete Service from PLANNING to PRODUCTION

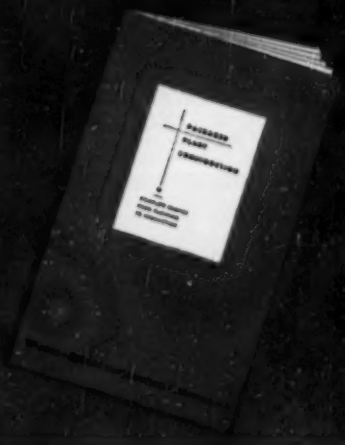


Whether the problem involves construction of facilities designed from pilot plant data, the development of new processes from flow sheets, or the expansion of present plant facilities, Wigton-Abbott Corporation "Packaged Plant Construction" offers the most economical and efficient solution in the shortest time.

A representative will be glad to consult with you on any phase of plant design and construction.

Yours for the Asking

Reading time, only 10 minutes —but it will save time and money by answering basic questions regarding this new concept in plant construction.



Wigton-Abbott Corporation

DESIGNERS . . . ENGINEERS . . . CONTRACTORS . . . PLAINFIELD, NEW JERSEY

News From Abroad

SPECIAL CORRESPONDENCE

Modern Food Processing Plant Opened At Monterrey in Mexico

Monterrey—A significant stride in Mexico's economic development has occurred with the opening of a $3 million food processing plant by Anderson, Clayton and Co. at Monterrey in northern Mexico.

The plant, termed one of the finest and most modern in the world, will utilize Mexico's booming cotton growing industry by converting cottonseed oil into vitamized margarines, hydrogenated shortenings, and a variety of mayonnaise, salad oils, cooking oils and allied products. It will also make peanut butter.

The plant consists of the following units: a refrigeration plant with ammonia compressors; a hydrogen gas plant supplying the hydrogenating equipment in the main plant; a power plant operating on natural gas (a special 14 kilometer gas line was constructed) to supply 44,000 lb. per hr. at 300 psi.; storage tanks; office building, and finally the main four story plant for manufacturing.

The main plant operates as follows: Raw cottonseed oil is brought in railroad tank cars to the plant where storage capacity of 4,200,000 liters holds the raw material until it is pumped to scale tanks (which weigh as well as take volume measurements) on the top floor of the plant.

Passing from the scale tanks the oil goes to a modern continuous refining process. The refining process removes various fatty acids, the oil is then purified by several washings, then dried to remove moisture, following which it is bleached and then deodorized in a vacuum tank. A 72-hr. "winterization" or cold treatment causes steariness in the oil to form crystals which are then removed by filtration. On the same floor, catalytic hydrogenation takes place.

On the third floor, the refined oil is held in storage tanks until it is called for in the various manufacturing processes on lower floors. To make maintenance easier, each type of line is painted a different color making identification easy inside and outside of the plant.

On the second floor are found the base of the larger tanks, such as the huge deodorization chamber, and here the various products are manufactured. Huge churns combine the refined, deodorized oil with mother culture and pasteurized milk to make the margarine, with the addition of vitamins A and D.

Hydrogenated oil plus stearine flakes is plasticized to become hydrogenated shortening, while refined water-washed vacuum-dried oil is deodorized and then mixed with vinegar, spices and eggs to make mayonnaise and salad dressing.

Also on the second floor are the laboratories where quality control will be maintained by checking each batch of products. The latest type of instruments for this purpose have been installed here. Machinery for manufacturing peanut butter is on this floor. This is a crop easily grown in Mexico, and, although peanut is absolutely unknown in Mexico at present, Acco hopes to overcome this and make it a major food product.

On the first are the highly mechanized bottling and packing apparatus. Each of these machines, the latest thing in synchronization and efficiency, are especially designed for the new Acco products and fill, close and seal packages automatically.

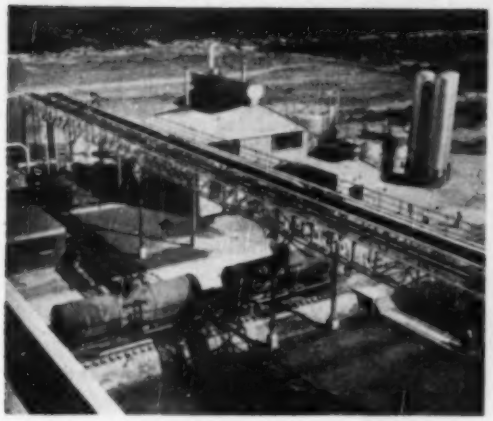
Packaging of shortening, margarines, etc., is done by bringing the finished product to a plastic state and then "injecting" it into packages which are then closed and moved to a chilling unit where the product hardens to the shape of the package.

Bottled products have the bottles pass through modern washing and sterilizing (by infrared rays) equipment and are then filled and sealed on automatic bottling equipment.

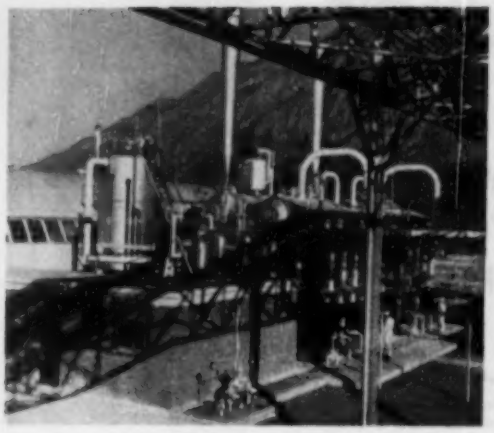
The plant will be able to produce cooking and salad oils at the rate of 2,400 bottles per hour, and margarine will be turned out at the rate of 2,500 packages (of four 100-gram bars each) per hour. Each kilogram package will be enriched with 20,000 units of vitamin A and 2,000 units of vitamin D.

(Continued)

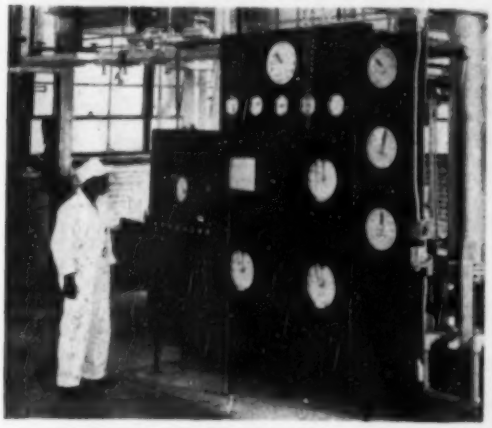
This vegetable oil food processing plant cost $3 million. The Anderson, Clayton and Co. unit will turn out 50 million pounds of food products per year.



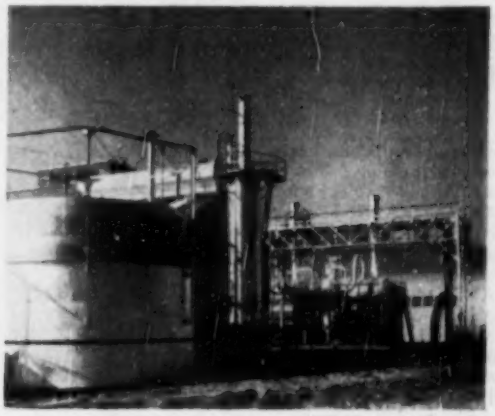
2 Crude cottonseed oil is delivered to the plant in tank cars. Oil is pumped into storage tanks.



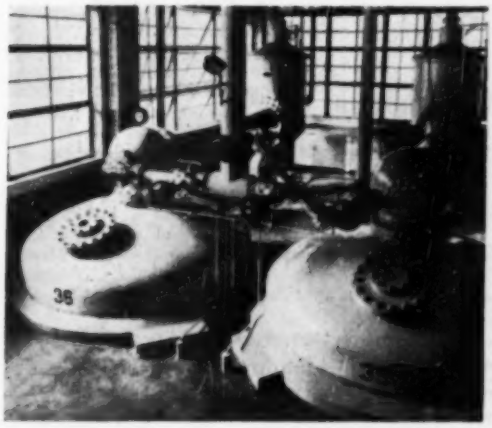
3 Steam boilers furnish power and process steam for deodorizing and refining oils. Boilers run on natuarl gas.



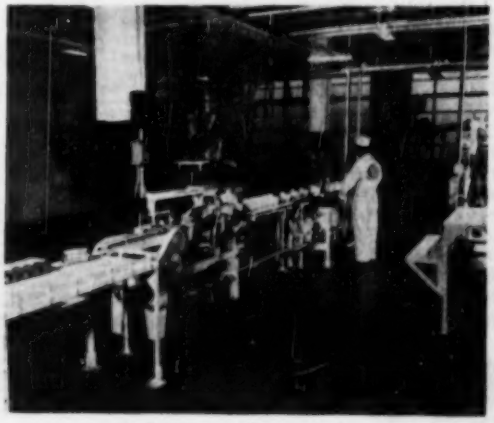
4 An engineer checks the control panel in the hydrogen unit. The gas is passed to vats where hydrogenation takes place.



5 In the foreground is part of the hydrogen gas unit. Product of this unit is used in hydrogenation.



6 Steam pressure-vats are used to de-odorize the oil in the refining process. Vacuum equipment is in the rear.



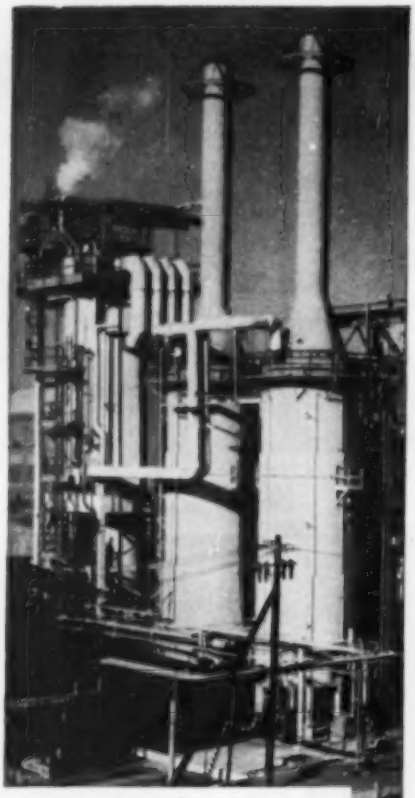
7 Here shortening is injected into packages which are sealed, cooled and shipped in refrigerator cars.

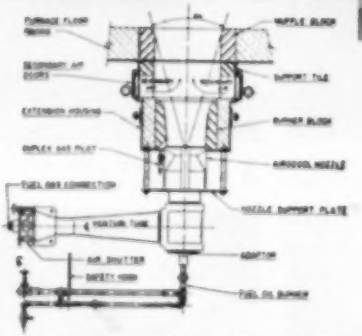
NATIONAL AIROIL FUEL OIL GAS BURNERS

WIDELY USED THROUGHOUT INDUSTRY . . .

UP-FIRED
OIL-GAS
TANDEM
COMBUSTION
UNITS

Yes, because of their extreme adaptability, "National Airoil" Vertical TANDEM COMBUSTION UNITS have been widely used throughout the petroleum industry. The TANDEM UNIT has a high turn-down ratio with a steady flame . . . maintains a high flame temperature with either fuel oil or gas; can be brought quickly to full capacity with a clean flame; and flame can be regulated and directed to uniformly radiate heat to the absorbing surfaces without impingement. The TANDEM COMBUSTION UNIT is also designed for firing horizontally, and for forced draft preheated air when necessary. It may also be applied to all types of boilers and process furnaces. Write for details about the TANDEM COMBUSTION UNIT and the various types available.





This diagrammatic drawing is of the National Airoil OIL-GAS TANDEM COMBUSTION UNIT (firing vertically upward) . . . widely used and popular in oil refineries throughout the nation.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes; STEAM ATOMIZING OIL BURNERS, MOTOR-DRIVEN ROTARY OIL BURNERS, MECHANICAL PRESSURE ATOMIZING OIL BURNERS, LOW AIR PRESSURE OIL BURNERS, GAS BURNERS, COMBINATION GAS and OIL BURNERS, AUTOMATIC OIL BURNERS, for small process furnaces and heating plants; FUEL OIL HEATERS, FUEL OIL PUMPING and HEATING UNITS, FURNACE RELIEF DOORS, AIR INTAKE DOORS, OBSERVATION PORTS; SPECIAL REFRACTORY SHAPES.

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Southwestern Division: 2512 South Boulevard, Houston 6, Texas

INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

British Firm Will Build Sulphuric Unit in Greece

Athens—Simon-Carves Ltd., Engineers, Cheadle Heath, Manchester, England, has recently signed a £250,000-contract to set up a sulphuric acid plant in Athens for a Greek chemical and fertilizer company. The United States, Germany, and Belgium also competed for the contract.

British technicians will supervise the work on the plant, which will chiefly be concerned with the production of superphosphates.

Heavy Water Pile Planned Near Ottawa

Ottawa—The Atomic Committee of the Canadian Parliament has proposed that Canada should build a second heavy-water radioactive pile at Chalk River, Ontario, near Ottawa.

Kellogg Awarded Contract For Canadian Refinery

Winnipeg — Canadian Kellogg Ltd. has been awarded a contract by Imperial Oil Ltd. for engineering and constructing a complete new refinery in Winnipeg, Manitoba. Parent firm is M. W. Kellogg Co. The refinery will have a capacity of 12,000 bbl. per day and is scheduled for completion by May 1951.

Winnipeg's first, the new refinery will more than double the refining capacity of the Province of Manitoba, whose three existing refineries total 5,300 bbl. per day. It is one of six completely new refineries or overall modernizations that Kellogg is presently either constructing or engineering in the United States, Canada, South America and Europe.

According to Kellogg, the proposed equipment will include an atmospheric and vacuum pipestill, a fluid catalytic cracking unit, a treating plant for gasoline and middle distillates, an electric sub-station, a utility plant and all off-site facilities.

Crude for the refinery will be moved either by rail or branch pipe line from a take-off point on the Interprovincial line at Gretna, Manitoba. Preparation of the site started in February.

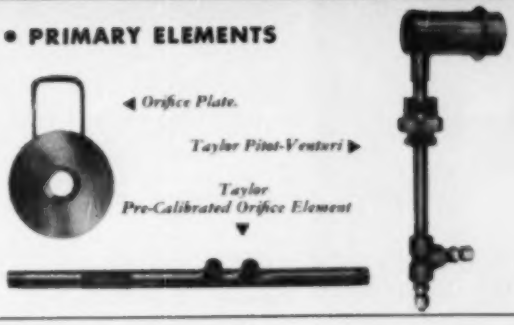
Canada Gets Another New Aluminum Research Unit

Ottawa—Aluminum of Canada's huge plant at Arvida, Que., has a new $1 million research laboratory wing

(Continued)

LET TAYLOR HANDLE YOUR FLOW PROBLEMS

• PRIMARY ELEMENTS



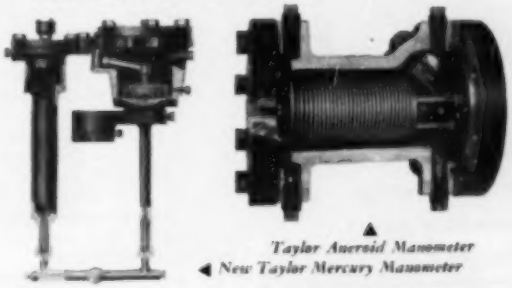
◀ *Orifice Plate.*

Taylor Pitot-Venturi ▶

Taylor Pre-Calibrated Orifice Element ▼

(1) Thin and thick type Orifice Plates from 2 to 24" in all standard materials. (2) Pre-Calibrated Orifice Assembly for high-accuracy with pipe sizes less than 2" are a "Specialty of the House" with Taylor. (3) The new and exclusive Taylor Pitot-Venturi Flow Element which produces greater differential with practically no pressure loss—7 to 10 times greater than by the conventional Pitot Tube. (4) Also standard Venturi Tubes. (5) Flow Nozzles from 3 to 14" in all standard materials.

• FOR MEASUREMENT

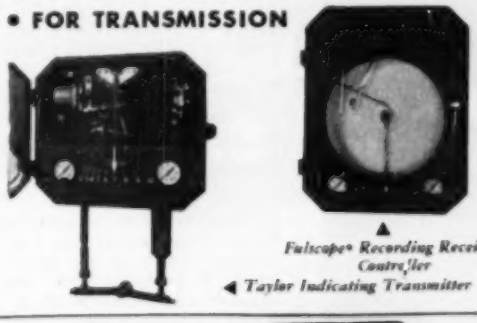


▲ *Taylor Aneroid Manometer*

◀ *New Taylor Mercury Manometer*

(1) New Taylor high-accuracy Mercury Manometer which features Teflon bearings, high energy output, submerged check valves, ½ of 1% accuracy, an adjustable leakless damping unit, and interchangeable range tubes for continuous ranges from 10 to 533 inches of water. (2) Taylor Aneroid (Mercury-less) Manometer, available in All-316 Stainless Steel or Cast Steel, accurately measures flow of hard-to-handle corrosive materials. No mercury to replace, no stuffing box. Sealing fluids or blow-back systems seldom needed. Long service. Easy cleaning. Easy range changes. Both Manometers available with Square Root Integrators.

• FOR TRANSMISSION



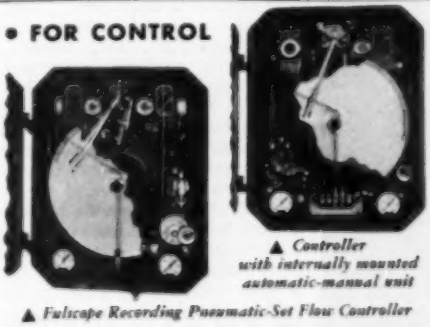
▲ *Fulscope* Recording Receiver Controller*

◀ *Taylor Indicating Transmitter*

Taylor Remote Transmission Systems accurately, quickly, economically, and safely transmit rate of flow to conveniently located point. Transmitters can be indicators, recorders or controllers. High accuracy—systems are calibrated to within ½ of 1% accuracy. High speed—only 2-second lag in 300 feet. Gives central control of widely distributed processes at one convenient point. Concentric dial transmitter with Mercury Manometer also available.

*Trade-Mark

• FOR CONTROL



▲ *Controller with internally mounted automatic-manual unit*

▲ *Fulscope Recording Pneumatic-Set Flow Controller*

Indicating or recording controllers in single or double duty form, with adjustable sensitivity or automatic reset. Ratio Flow Controllers with two Manometers attached. Control point may be adjusted by any other process variable. Pneumatic-set controllers whereby control point can be pneumatically adjusted from any remote location. Internally or externally mounted automatic to manual units.

• • •

For complete details, write for new Flow Catalog 98175, or ask your Taylor Field Engineer. He'll show you how Taylor Instrumentation can help you solve *any* flow problem. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

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90% OPEN AREA
for light and ventilation

THE illustration shows the admission of light through three floors where the flooring is Hendrick Mitco.

Not only does pressure-formed Hendrick Mitco Open Steel Flooring have 90% open area, but there are no bolts, rivets or angle irons to collect dirt and refuse. The square-edge, uniformly spaced, rectangular steel bars provide a non-slipping, level walking surface. There is no lateral deflection, however heavy the loading, because each Mitco panel is a strong, integral unit.

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● Whether you want conventional high-pressure units or something special—send us your inquiries. COLE can build you the kind of high-pressure tanks or vessels you require—any size, any shape, any metal. Our experience (of almost a century) in the design and fabrication of metal tanks may be of help to you. Write for catalog—"Tank Talk."

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NEWNAN, GA.

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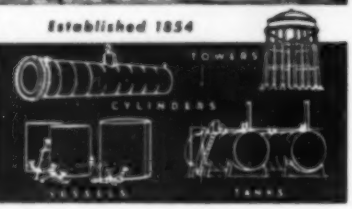

ready to embark on an expanded program of new product development and refinement of aluminum alloy techniques. It includes a pilot production and testing plant, a two-story laboratory wing and a 5,500 sq.ft. auditorium.

Now being completed by Foundation Co. of Canada, the building features outside walls completely faced with aluminum extrusions, the first in Canada and one of the world's first to be so built.

Bombay's Prohibition Laws Are Turning Alcohol to Fuels

Bombay—India's pressing shortage of petroleum products and her inability to pay for heavy imports has brought a decision to convert the huge government distillery at Nasik, Bombay province, to the production of a million imperial gallons of power alcohol a year.

The decision fits in with the Indian government's policy of progressive prohibition under which Bombay province will go "dry" after next April. Large orders for conversion equipment have been placed in Britain and first deliveries are expected soon.

In the first stages the denatured alcohol will be mixed with the gasoline consumed by the Bombay provincial bus lines. Test have shown that mixtures of up to 50 percent alcohol and 50 percent gasoline give good performance in the heavy-duty engines.

Aussies Using Indian Ilmenite for TiO_2

Melbourne — Australian Titan Products Pty. Ltd., a subsidiary of British Titan Products Co. Ltd., has disclosed details of the process by which it produces 1,800 tons of titanium oxide annually at its new Burnie, Tasmania, plant. The pigment has found a ready market in the Australian paint, enamel, rubber, soap, cosmetics, paper and textile industries.

The raw material, ilmenite ore, is imported from Travancore, India. Though Australia produces large amounts of ilmenite concentrate from the beach sands of the Pacific coast, it is not suitable for pigment manufacture because of its high chromite content, ranging from 1 to 4 percent. The material is not easily soluble in acid and assays less than 50 percent titanium oxide. It is a byproduct in the separation of high-grade zircon and rutile concen-

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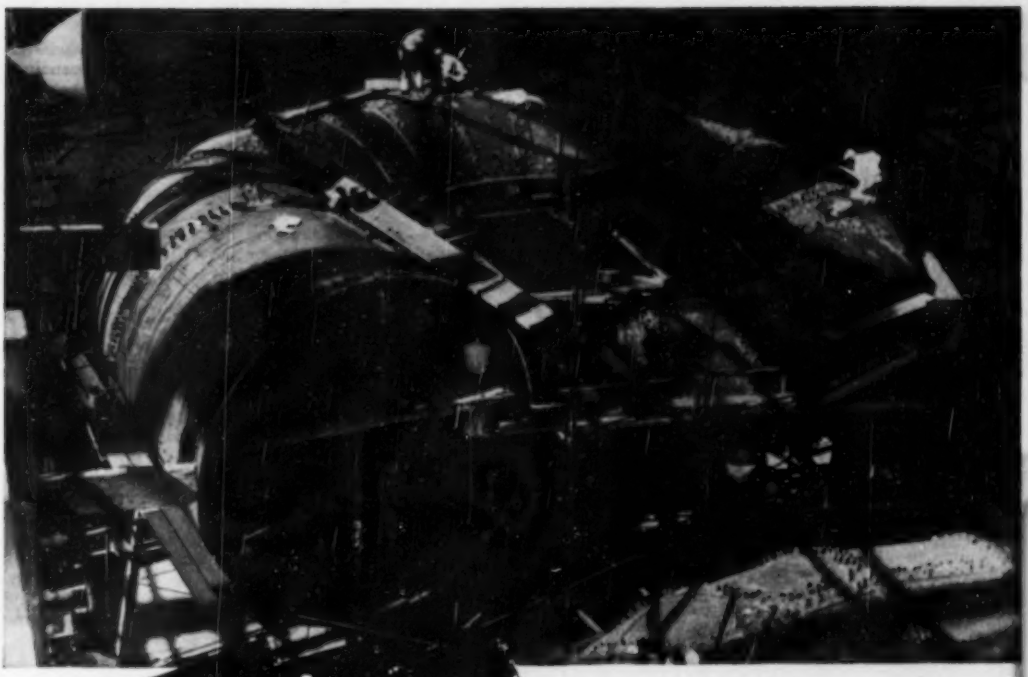

—and special work too!

Turning out high-performance refinery and chemical plant equipment, record-making tankers and cargo ships is our main business. Such work calls for facilities so vast and skills so varied that Sun Ship also does a wide assortment of special industrial jobs—here, for example, building the scroll case of a turbine for generating electricity by water power . . . Sun Ship facilities and skills are at *your* command.

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SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE (SINCE 1916) CHESTER, PENNA.

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MILTON Roy PUMPS

NEW!

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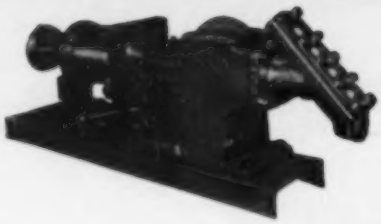
CONTROLLED
VOLUME
CHEMICAL PUMPS



These are positive displacement, precision metering units, with the exclusive Milton Roy double-ball check liquid ends, powered by simple air cylinders. Plunger stroke length (capacity) is adjustable while operating by means of screw and handwheel. Capacities from 0.4 to 405 gph. Pressures to 20,000 psi. Plunger diameters from 5/16" to 3½". For controlled volume pumping . . . practically all chemicals, slurries, solids in suspension, etc. Sanitary liquid ends are available. Ideal units for automatic feed systems. Literature describes proportional feed, blending or formulating, constant speed, hydraulic pressure and bottle filling systems . . . contains capacity-pressure and air consumption tables, etc. . . . Write for it.

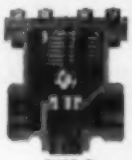
MILTON Roy COMPANY
1322 E. MERMAID LANE, CHESTNUT HILL, PHILA. 18, PA.

Nicholson Steam Traps

STOP BACK-UP of CONDENSATE

Operate on Lowest Temperature Differential

Repeated comparative tests by large trap users show that Nicholson steam traps operate on lowest temperature differential, and thus prevent waterlogging. Plant records show that, by keeping equipment full of live steam, they have increased production of cooking kettles, for example, as much as 30%. Widely specified for preventing damage to thin gauges. Eliminate "cold blow" in unit heaters. 5 types for every industrial application. Size ¼" to 2"; press. to 225 lbs. BULLETIN 1047.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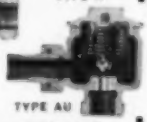
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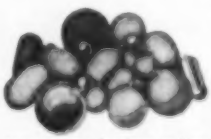
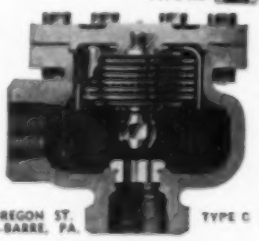


HIGH-PRESSURE FLOATS—Stainless, monel, steel or plated steel. Welded. In all sizes and shapes; for operating mechanisms and as tanks or vessels. 2-day delivery. BULLETIN 348.


TYPE C

W. H. NICHOLSON & CO. 206 OREGON ST. WILKES-BARRE, PA.

trates and the fate of a stockpile of more than 30,000 tons is depending on the outcome of researches into the separation of the chromite.

The finely ground ilmenite is reacted with strong sulphuric acid obtained from the contact plant of the Electrolytic Zinc Co. of Australasia at Risdon, near Hobart. The resulting digestion cake is dissolved in water and the solution is clarified and cooled. Crystals of copperas which separate out at this stage are removed by centrifuging and sold as byproduct.

The clear solution is boiled under controlled conditions to precipitate hydrated titanium oxide. The precipitate is washed free from impurities by passage over a series of rotary filters and then roasted at a high temperature in a rotary kiln. During the roasting operation the particles of oxide grow until their diameter reaches half a wavelength of visible light. To obtain this result without sintering, both the precipitation stage and the roasting stage must be carefully controlled. After roasting, the oxide is finely ground.

Shell and Vacuum Refineries Run Again in Sumatra

Amsterdam—Royal Dutch Petroleum Co. refineries in Sumatra are again working at full capacity, producing 350,000 tons a month. The same is true of the Sumatra refineries of Standard-Vacuum, which produce 250,000 tons a month.

Oil-From-Sand Studies Are Pushed in Brazil

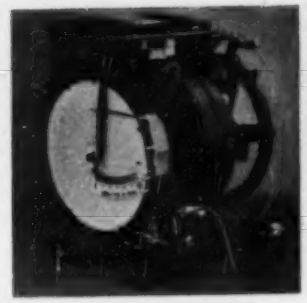
Rio De Janeiro—A Brazilian company is selling oil taken from bituminous sand and two others are experimenting in extracting petroleum from shale deposits.

The bituminous sand deposits are near Guarei, state of Sao Paulo, and gasoline refined by the Itatig Co. is being sold there. Production is small, and distillation of only about 10,000 liters a day is planned.

At Taubate, in the same state, the Companhia Nacional de Oleos Minerais has built a shale oil pilot plant which now turns out small amounts of gasoline, diesel oil, heavy fuel oil and paraffin. The company has just reached agreement with the Foster-Wheeler Corp. of New York for erection of a 6,000-bbl.-a-day plant. The firm is capitalized at about $1.5 million.

Nearby, at Pindamonhangaba, the

(*Continued*)



Dual meter with high pressure ring using mercury for sealing fluid. Oil is used in low pressure ring.

Mercury level is not critical, in

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Meter case for single ring meter. Case for dual meter occupies same panel space but is 5 inches deeper.

In conventional meters, mercury level must be exactly right to start with, and any loss of mercury throws the meter out of calibration.

Mercury level, however, is one of the many things you don't have to worry about in Hagan Ring Balance Flow Meters. The sole function of the mercury is to serve as a seal, and the only care necessary is to keep the level high enough for that purpose.

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Cirb company, with about $1 million capital, is experimenting at extraction of shale oil, and is building its first retort, to produce gasoline, diesel oil and heavy fuel oil.

One reason these plans are going forward—in the face of some evidence in other countries that such production is uneconomical—is the desire of Brazilians to free themselves from dependence on petroleum importation. The country spends roughly $300,000 a day on oil imports and can ill afford this outgo of foreign exchange.

Oil wells in the Bahia area, the only region of Brazil where concentrated drilling has gone on, promise to be fair producers. At present, they are mostly capped, but some of this oil will be used when a 2,500-bbl.-a-day refinery is completed at Bahia, perhaps this year.

The government's national Petroleum Council also is ready to drill this year on and near Marajo Island, at the mouth of the Amazon, and on the Tocantins River not far from Carolina, state of Maranhao. Geological and geophysical surveys indicate good possibilities in those areas.

Plans are going forward for erection of three fairly large refineries. The biggest, near Santos, state of Sao Paulo, would produce 45,000 bbl. a day and would be operated by the federal government. The other two, at Rio de Janeiro and Sao Paulo, would have outputs of 25,000 and 20,000 bbl., respectively, and would be privately owned.

Nationalization Threat Removed From Britain's Chemical Industry

London—For the time being, the nationalization of Britain's chemical industry is off. So much is certain after the indecisive outcome of the Parliamentary elections; for even if the Labor government persists in its socialization policy, the practical difficulties which it faces are so formidable as to exclude the possibility of leading chemical combines being transferred to State ownership during the—probably short—life of the present House of Commons. But there remains a danger of the socialization issue becoming acute again before long. "One industry which will be carefully examined is the chemical industry," said

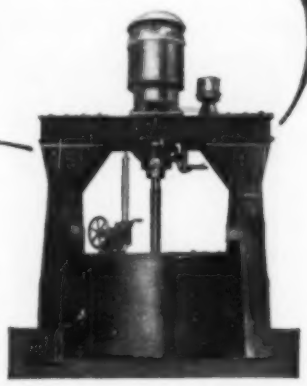
(Continued)

SELF-BALANCING

increases

EFFICIENCY

IN



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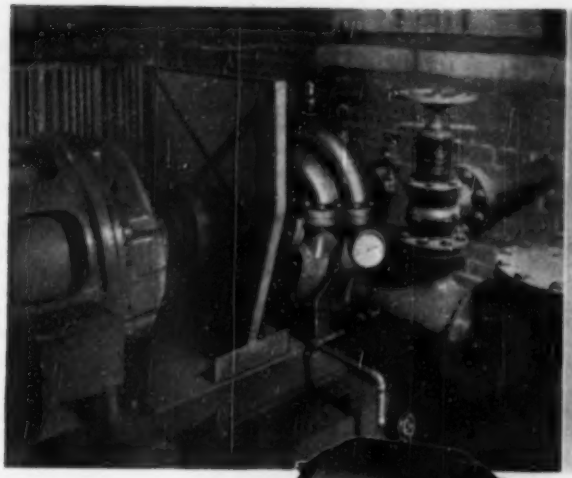

LONG ON THE JOB *SHORT* ON REPAIRS

Above, "Buffalo" "CS" Pump, one of a complete line of centrifugal pumps for every chemical liquid.

Users in every branch of industry report two things about "Buffalo" Pumps: (1) they stay on the job for years with minimum maintenance, and (2) they do their given jobs efficiently.

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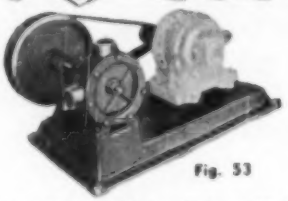

Fig. 53

Quiet V-Belt Motor Driven Unit

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the Labor election manifesto, and it will remain the party's aim to "transfer to public ownership any appropriate sections of this vital industry." Not only the Labor Party but the trade unions favor nationalization of the chemical industry, and the fact that Labor election speeches included only vague and indefinite references to chemical production cannot hide the intention of an influential group on the left wing to bring at least some sections of the industry, especially those now operated by combines, under state control and management.

The nationalization issue was certainly not forgotten when the Association of British Chemical Manufacturers in response to a request from the President of the Board of Trade drew up a "Report on the Chemical Industry 1949." The report contains no direct reference to nationalization but states the conviction that "the national purpose will best be served by the utmost freedom of enterprise." This view is shared by all British chemical manufacturers. The report has been justly welcomed as a masterly exposition of the chemical industry's work, aims, plans and problems and will no doubt be one of the principal pieces of evidence if the nationalization issue becomes topical.

Dealing with the monopoly charge, which is often adduced as an argument for socialization, the association frankly admits the existence of patent and economic monopolies and of price conventions in the chemical industry but defends "monopolistic practices" on the ground that they are essential to efficient operation and have not in fact driven up prices. The advocates of a state monopoly find no cause for quarrel with the first part of this argument as a nationalized chemical industry would obviously be a monopoly, but may question the validity of its second part. There is a minority view among British chemical manufacturers holding that monopolies arising from patents may discourage invention directed towards alternative and possibly more economic processes of production and may in the long run prove not to be in the national interest. This minority view is mentioned in the report; in general however there is widespread agreement among British chemical firms as to the policy to be pursued by industry in its dealings with government.

The industry's best answer to the nationalization threat is found in the ambitious plans drawn up to meet all chemical needs in Britain and improve the import—export ratio. Whether chemical imports will really

(Continued)

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Tidewater Red Cypress — The Wood Eternal

be halved, as the association speaking on behalf of the chemical industry assumes, and whether the export markets will be capable of absorbing the large output surplus available if, as forecast, Britain's chemical production capacity expands by 70 percent within five years from the end of 1948 remains to be seen. But chemical industry can certainly not be charged with having neglected to plan for a big expansion to meet the needs of other industries.

Exports in 1949 were disappointing, and this will have a depressing influence on current and future export plans even though the position has changed. The final figures for 1949 showed a value increase by less than 7 percent British chemical imports, on the other hand, last year declined by fully one-sixth, from £30,730,000 to £25,330,000, and it is confidently predicted that a further substantial saving will be achieved this year thanks to increased home production of petroleum chemicals, carbon blacks and plastics. Last year the United States was Britain's biggest chemical supplier, with total shipments of £6,430,000 against £9,090,000 in 1948; these imports are to be cut down further during the current year.

As far as carbon blacks are concerned, the works of United Carbon Black Ltd. at Swansea, South Wales, are now in production, and the plant under erection at Ellesmere Port for Cabot Carbon Co. Ltd. is expected to commence operations in June; Godfrey L. Cabot Inc. of Boston, Mass., will provide more capital than originally intended. As for plastics, leading manufacturers believe that the difficulties which arose toward the end of 1948 as a result of over expansion have now been overcome. Expansion schemes concluded last year or in progress now will raise the output capacity by more than half over that found excessive at the end of 1948, but it is hoped to create new outlets, especially for the newer products. The first large-scale manufacturing unit for polystyrene will be opened by Monsanto Chemicals Ltd. in June or July, and Erinoid Ltd., the company which associated with Petrochemicals Ltd. for the manufacture of styrene, polystyrene and its derivatives and hoped to have limited bulk supplies available early this year, will presumably also start large-scale production before the end of this year. In the production of nylon, delays have arisen as the completion schedule for the new ICI polymer factory at Billingham was upset; a

(Continued)

OIL TANKS USE BARCO BALL JOINTS to RELIEVE SHOCK and STRAIN

Barco ball joints are used on this pipe line in the oil fields to allow for tank-settling, to relieve earthquake shocks and any strains on costly valves. Barco also facilitates quick break-down and setting-up of drilling rig equipment.

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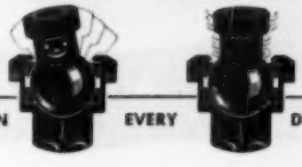

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AAF Electro-Matic Precipitators guard product's Crystal-Clear Transparency during processing

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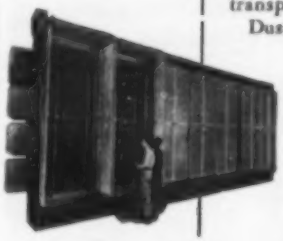

Dust and dirt could easily mar such transparency if permitted to reach this material in the early stages of production. That's why all air supplied for the casting operation is delivered through ducts, as shown at left, after being thoroughly cleaned by AAF filters. Electro-Matic† Electronic Precipitators, similar to the units shown above, were selected because of the high degree of cleaning efficiency demanded.

Clean air has been the means of improving product quality, cutting rejects and reducing plant maintenance for many companies. But needs vary by product and industry. That's why AAF offers a complete line of filters ranging from electronic types to the simple throwaway unit. Regardless of your requirements, AAF has both the products and the engineering experience that insure the selection of the right filter for your job.

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FOREIGN NEWS, cont. . .

figure of 5,000 tons has been mentioned for the projected British nylon polymer output.

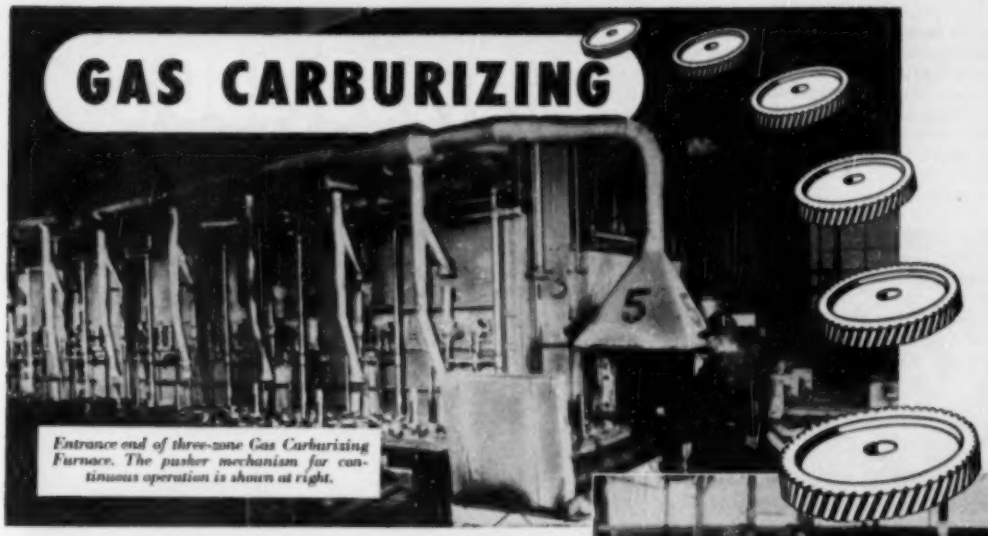
Phenol supplies have increased so greatly that they are adequate for all needs. The output of aminoplastics has risen substantially since the middle of 1949 when the new urea factory of ICI came into operation. A new factory for melamine molding powders is under construction for British Industrial Plastics Ltd. The production of vinyl resins is also expected to expand considerably this year. The British output of acrylic sheet is equal to U.S. output. The new ICI polyethylene plant at Wilton is expected to come into operation next year. Later it is proposed to provide new or additional plant for Terylene polymer, cellulose products, the vinyl chloride group and polytetrafluoroethylene.

Two new enterprises of considerable potential interest for the chemical industry were registered last month. They are remarkable in particular because of the wide interests and industrial importance of the founders. Isotope Developments Ltd. has been formed with the comparatively modest capital of £25,000 to "develop and turn to account the uses of radioactivity and the uses of radioactive and stable isotopes." Among its shareholders are British Celanese Ltd., Distillers Co. Ltd., Guest Keen and Nettlefolds Ltd., Patons & Baldwins, Prudential Assurance Co., Tootal Broadhurst Lee Co. and Vickers Ltd. The new company is understood to have set itself the task of acting as consultants in the industrial use of radioactive isotopes.

The other new formation concerns the Engineering Equipment Users' Association which was formed to provide its members with the means for exchanging information on standardization of engineering materials and equipment which they use in common. The first five members are the Anglo-Iranian Oil Co. Ltd., Courtaulds Ltd., Imperial Chemical Industries Ltd., Lever Bros. and Unilever Ltd., and Shell Petroleum Co. Ltd. When experience has been gained, it is hoped that arrangements can be made for other user firms to take part in consultations on matters of standardization. There is no doubt that, if the Association can do useful work in this limited field, it can play a more extensive role in representing consumers' interests in the engineering equipment field. The first five members are all especially interested in chemical engineering equipment.

—End

GAS CARBURIZING



Entrance end of three-zone Gas Carburizing Furnace. The pusher mechanism for continuous operation is shown at right.

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INCREASED PRODUCTION of case hardened precision gears and pinions is obtained from these GAS heated furnaces. Two-zone furnaces, manually operated, carburize ring and side gears, pinions and pinion mates. Four-zone furnaces automatically carburize and quench shafts and gears for heavy-duty transmissions and torque converters.

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OPERATING DATA

	Zone 1	Zone 2	Zone 3	Zone 4	Capacity lb/hr	Capacity Cycle
2-zone furnace	1700°F	1650°F	.....	.....	660 net	7 hr
	Continuous pusher type with fan circulation of gas					
4-zone furnace	1725°F heat	1725°F Carburize	1150°F Cool	1550°F Reheat	920 net	10 hr 48 min

RX Gas Generators which supply correct carbon content atmosphere for carburizing.

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These carburizing furnaces provide another example of the versatility of GAS for metal treating with characteristic results:

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- Uniform case depth and carbon concentration with continuous operation
- Consistent low rejection loss due to warp and distortion

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Photographs — courtesy of Surface Combustion Corporation, Toledo, Ohio, Manufacturers of Industrial Gas Furnaces.

AMERICAN GAS ASSOCIATION
420 LEXINGTON AVE., NEW YORK 17, N.Y.

The Corrosion Forum

EDMOND C. FETTER, Managing Editor

"Scotch" Tape: New Protective Coating

The Brooklyn Union Gas Co. may be starting something with their new use for Scotch tape. They are using it to wrap the welded steel joints of some new gas mains they're putting down in Brooklyn, N. Y. They expect the Scotch tape wrap to cost a third less than the usual joint protection (asbestos wrap mopped with hot coal tar). The pictures on this and the next two pages show how it is applied.

The tape is polyvinyl chloride film with pressure sensitive adhesive on the back. It is made by Minnesota Mining and Manufacturing Co. and sold as Electrical Tape No. 22. It is 10 mils thick, comes in various widths up to 10 in., and in large quantities costs around 20c. a sq. ft. The same tape has been used for several years as electrical insulation, but no one thought of using it for corrosion protection until last November when Brooklyn Union adopted it. Since then the Philadelphia Electric Co. has used it to wrap underground electrical conduit and Ebasco Affiliates to protect individual gas service lines. American Cyanamid and some other chemical companies are trying it on above-ground plant piping where corrosive fumes have required frequent repainting. The chemical companies are covering entire piperuns, not just joints as in the Brooklyn Union job, in the expectation that the wrap will last a lifetime. For above ground applications one layer of tape with half inch overlap is sufficient; the cost of the tape on a big job would come to about 22c. per sq. ft. of pipe surface.

STEP 1: Covering sharp points prior to wrapping joint in new gas main with polyvinyl chloride Scotch tape. Pipe has previously been well cleaned (p. 250).

STEP 2: Putting on first layer. Brooklyn Union used one roll of tape per joint; roll is 36 yd. long, 4 in. wide, costs $7 in large quantities.

(Continued)

"CORROSION of buried plant and its contingent losses are costing American industry about a billion dollars per year," says the September, 1948, issue of the authoritative *Corrosion* magazine. If you operate water, gas or oil lines, communications, signal and power cables, rail tracks, tanks, equipment foundations, or a host of other metallic structures, buried or in unprotected contact with soil or water, you are no doubt footing your share of this colossal waste.

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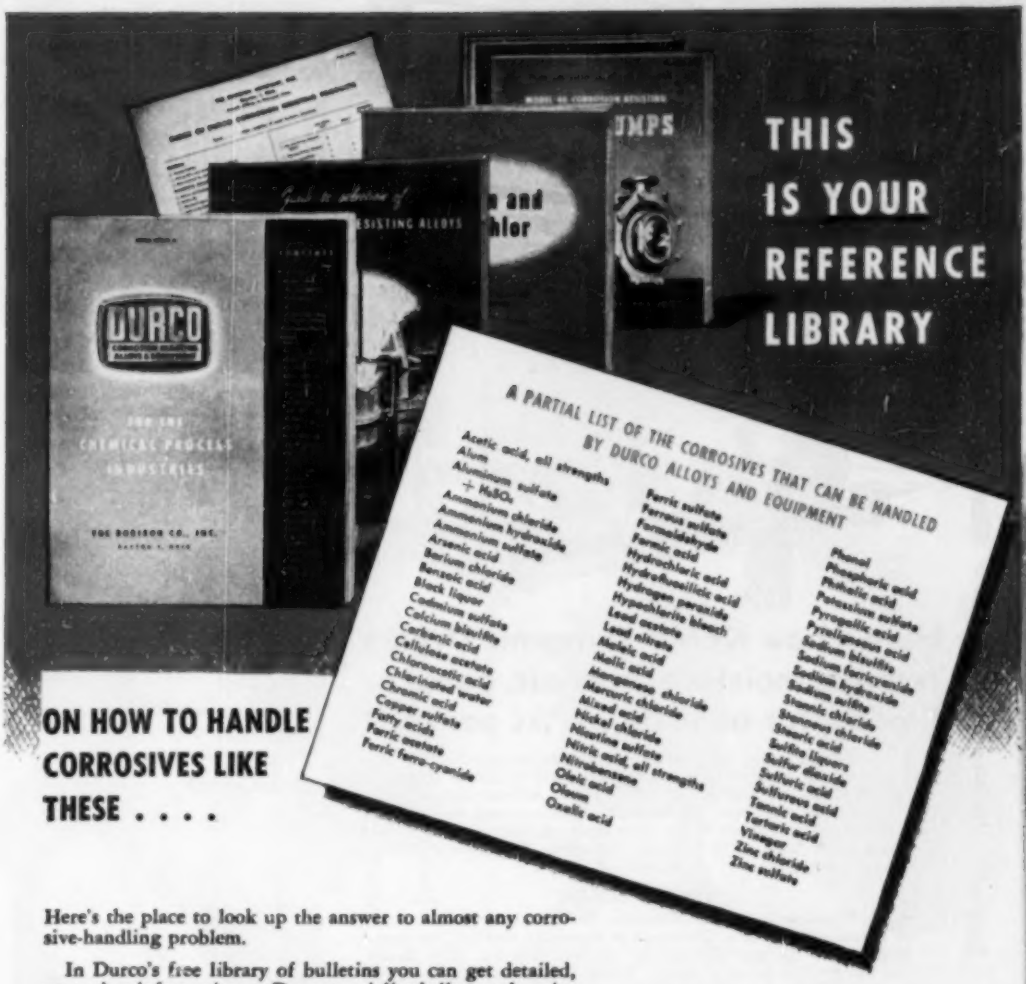
Ease of application, reasonable cost, fast and clean to handle: These are perhaps the chief advantages of polyvinyl chloride Scotch tape as revealed in its first application as a corrosion resistant coating. Chemical resistance of the vinyls is well known; they are the basis of a great many industrial paints. So far the tape has been used in chemical plants only for pipe coating, but Minnesota Mining is looking into the coating of broader surfaces for protection against fume and corrosive atmosphere. Although first cost is higher than painting (20c. a sq. ft. for material), long-run cost may be less—the tape is 10 mils thick and should be permanent.

STEP 3: Coming back for second layer. Compared to regular joint wrap (asbestos plus hot coal tar) Scotch tape is easier, cheaper, and workmen can't get burned.

FINISHED: Brooklyn Union "discovered" Scotch tape for corrosion protection, used it first on this job. Vinyl film is tough, chemically resistant.

(Continued)



Here's the place to look up the answer to almost any corrosive-handling problem.

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If you have anything to do with buying or specifying equipment to handle corrosives, you should have at least part of this reference library in your file.

Listed below are some of the major bulletins and the Index which lists all Durco product bulletins. Just check what you want, and mail this page with your name, title and company address to Durco.

DURCO Adv. 118-GM

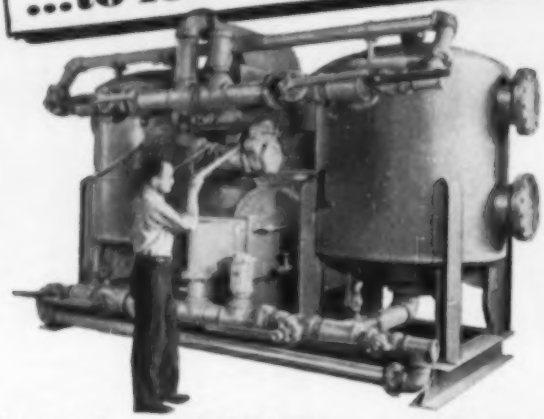
A Guide To The Selection Of Durco Corrosion-Resisting Alloys	Bul. 100
Duriron & Durichlor	Bul. 113
Durimet 20	Bul. 312
Chlorimet 2 & 3	Bul. 114
General Catalog M	
Model 40 Durcopumps	Bul. 815
Self-Priming Durcopumps	Bul. 816
Split Flanged Pipe & Fittings	Bul. 704
Exhaust Fans	Bul. 1103
Angle Valves	Bul. 615
Non-lubricated Plug Valves	Bul. 619
Lubricated Plug Valves	Bul. 636, 637, 638, 640
Heat Exchangers	Bul. 1610A
Index Of Durco Corrosion Resisting Products	Form AD-15B

THE DURIRON CO., INC.
DAYTON 1, OHIO
Branch Offices in Principal Cities

DURCO
ALLOYS & EQUIPMENT

DRY ...to low dew points

AIR — CO_2
AMMONIA — GASOLINE
NITROGEN — PROPANE



Here's how KEMP Dynamic Dryers remove moisture from air, gases or liquids, for as little as ¼c per mcf!

IF YOU think drying air, gases or liquids cost too much—find out how Kemp can save you money! Hundreds of Kemp Dynamic Dryers *control moisture at low cost* in plants all over the country. Operation is guaranteed to your specifications and the cost is surprisingly low. Many Kemp users report drying to *sub-zero* dew points for as little as ¼c *per mcf*—including all charges for labor, capital investment and materials!

FLEXIBLE DESIGN

Kemp Dynamic Dryers are versatile—offer *manual, semi-automatic* or *automatic* operation. Desiccant is especially selected and compounded for the type drying your problem calls for. With Kemp you can dry *air, gases* or *liquids, control humidity* in large or small areas, or *eliminate moisture* in materials. Gas, electric or steam regeneration is supplied as standard equipment.

SEND FOR INFORMATION

Whether your moisture control problem is special or standard, you'll find Kemp has a Dynamic Dryer especially designed to solve it. Find out how Kemp engineering can save you money. Get the facts. Bulletin D-27 contains specifications, technical data and full information. For your free copy, mail coupon today!

KEMP OF BALTIMORE

DYNAMIC DRYERS

CARBURETORS
BURNERS
FIRE CHECKS
ATMOSPHERE & INERT GAS GENERATORS
ADSORPTIVE DRYERS
METAL MELTING UNITS
SINGEING EQUIPMENT
SPECIAL EQUIPMENT

THE C. M. KEMP MFG. CO., Dept. F-4
405 E. Oliver St., Baltimore 2, Md.

Gentlemen: Please send me Information Bulletin D-27. We want facts on drying ( ) air ( ) gas ( ) liquids.

Name .....
Company .....
Address .....
City ..... Zone ..... State .....

How pipe joint is prepared for "Scotch" tape wrap

Wire brushing welded joint. For lasting adhesion it pays to clean thoroughly.

Peening down weld marks, pips, other sharp points that might cut tape.

Wiping off dust with alcohol and water. Improves effectiveness of adhesive.

Drying with blowtorch. Heating also makes tape easier to apply. (End)

4 Standard Lines of Pfaudler Process Equipment

. . . and how they can save money for you

Before placing your next order for corrosion resistant processing equipment, it will pay you to check the possibilities of using *standard* equipment. Why? To save money. Consider—all engineering is completed. Designs are tested and proved. All performance factors are known. Standard parts are stocked. Fabrication is handled on a routine basis. You get the benefit of all savings. Pfaudler offers a wide choice of standard equipment to meet your needs.

1 **Standard Pfaudler Heat Exchangers and Tubular Condensers**

Types: Fixed tube sheet, non removable tube bundle; Packed floating head-removable tube bundle; Internal floating head—removable tube bundle; U tube with packed floating head. Standard design features includes shell diameters, 4" to 24"; pressures — full vacuum, 75, 150 psi; rigid tolerances, ASME code U-69 construction; tube sizes—$\frac{5}{8}$", $\frac{3}{4}$" and 1" O.D.; tube size passes—1, 2, 4, 6 or 8; use of cross flow baffles on shell side.

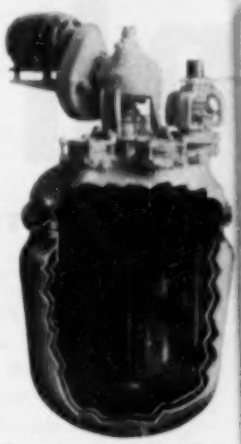
2 **Standard high pressure "R Series" Glass-Lined Reactors resistant to all acids (except H. F.) at elevated temperatures and pressures.**

Capacities: 200 to 2000 gallons. Features: Jacketed ASME code welded one-piece construction with clamped manhole openings; highly acid resisting Pfaudler glass lining; impeller type glass covered steel agitators with adjustable baffles; heavy-duty motor drives; standard top-head openings to meet varied requirements based on long experience. Custom-built units of larger size follow basic "R" design.

3 **Standard Pfaudler Jacketed Stainless Steel Reactors**

Capacities: 5 to 500 gallons. Features: Jacketed ASME code welded construction with clamped top heads. Liners and heads, type 304 stainless steel; jackets, carbon steel welded to stainless sealer; anchor or impeller stainless steel agitators with motor drives; ample vapor outlets on top heads, constructed of stainless steel. Custom-built units of larger size follow this basic design.

4 **Standard low pressure "E Series" Glass-Lined Reactors resistant to all acids (except H.F.) at elevated temperatures and pressures.**



Capacities: 2 to 2000 gallons. Features: Jacketed ASME code welded construction with clamped top-heads; highly acid resisting Pfaudler glass lining; anchor or impeller type glass covered steel agitators (baffles optional); heavy-duty motor drives; standard top-head openings to meet varied requirements based on more than 25 years of experience.

MAIL THIS FORM

Pfaudler

Engineers and Fabricators of Corrosion Resistant Process Equipment

GLASS-LINED STEEL—Hastelloy • Aluminum Tantalum • Teflon • Carbon Steel • Solid or Clad Stainless Steel • Nickel • Inconel • Monel

A COMPLETE PROCESS OR INDIVIDUAL UNITS

Pfaudler Technical Service can show you how to best utilize Pfaudler standard or custom-built process equipment for a complete process or where only an individual unit is required. Use the coupon as a starter.

THE PFAUDLER CO.,
Dept. CE-4, Rochester 3, N. Y.

Please send me information about
☐ "E Series" Reactors; ☐ "R Series" Reactors; ☐ Standard Stainless Steel Reactors; ☐ Standard Heat Exchangers; ☐ Pfaudler Technical Service.

Name .....

Company .....

Address .....

City ..... State .....

in paper manufacture— Only a small amount of Tributyl Phosphate is required—usually less than 0.1% by weight based on the solids, depending on the application involved. Thus, a minimum of Tributyl Phosphate remains in the final product with no residual odor. Because of its high efficiency, Tributyl Phosphate is the preferred anti-foam in the paper industry.

tributyl phosphate

ANTI-FOAM AGENT

Tributyl Phosphate is an odorless, colorless liquid, is miscible with most common organic solvents, and is a good solvent for a variety of other materials. It has a surprisingly low melting point for such a high-boiling liquid.

for synthetic latex paints

Addition of a fraction of 1% (based on solids) to this type of paint reduces foaming during application and improves the leveling characteristics of the paint film. Synthetic latex paints sometimes tend to coagulate during application and Tributyl Phosphate minimizes this tendency.

other uses—Tributyl Phosphate has helped solve many industrial foam problems encountered in the manufacture of such products as—inks, textile sizings, casein solutions, water-soluble adhesives, and rubber latex.

SPECIFICATIONS

Specific Gravity at 20°/20°C	0.973 to 0.983
Acidity as Phosphoric Acid	0.05% by wt. max.
Water	No turbidity when one volume is mixed with 19 volumes of 60° Be. gasoline at 20°C.
Color	Water-white

PROPERTIES OF COMMERCIAL GRADE MATERIAL

Boiling Point at 27 mm. of mercury	177°-178°C
Melting Point	Below —80°C
Flash Point, Cleveland Open Cup	294°F
Viscosity at 25°C	3.41 centipoise
at 85°F	38.6 Saybolt seconds
Dielectric Constant at 30°C	7.97
Weight per U. S. Gallon	8.13 pounds at 68°F
Solubility in Water	0.6% by volume at 25°C
Solubility of Water in Tributyl Phosphate	Approx. 7% by volume at 25°C

WRITE, WIRE, OR PHONE CSC TODAY FOR A SAMPLE AND FURTHER DATA

COMMERCIAL SOLVENTS CORPORATION • 17 EAST 42nd ST., NEW YORK 17, N.Y.

PRODUCTS OF THE INDUSTRIAL CHEMICAL DIVISION

Ethyl Alcohol & Derivatives • Acetone • Butanol & Derivatives • Formaldehyde
Methanol • Amines • Nitroparaffins • Crystalline Riboflavin

CSC

Names in the News

MAN OF THE MONTH

Harry B. McClure

There were smiles all around when Harry B. McClure was announced as the recipient of the first Commercial Chemical Development Association Honor Award—"to provide annual recognition of an individual who has made outstanding contributions to the commercial chemical development field."

A real "people's choice," the Carbide and Carbon vice president also comes close to rating the label "perfect choice." You might call it type casting. His career, devoted entirely to chemical market research, has been grooming him for the role from the beginning.

After receiving B.S. and M.S. degrees from the University of Pennsylvania in 1928, he joined the Carbide organization's technical division. He set to work to develop methods of manufacture on a "tonnage" commercial scale of synthetic organic chemicals. He became expert at building pilot units to make 100,000 to 1,000,000 pound quantities per year. In 1936 he moved to the fine chemicals division. He was made division manager a year later. Since 1944 he has been vice president of Carbide and Carbon Chemicals Division, Union Carbide and Carbon.

The direct result of these years of labor has been the introduction to industry of approximately 200 synthetic organic chemicals. Many were only laboratory curiosities in 1930. Today they are being shipped in tank cars to manufacturers of plastics, synthetic textiles, protective coatings and pharmaceuticals, among others.

Mr. McClure is well known as an author and speaker on chemical development topics. Besides the CCDA, he holds membership in the Chemical Market Research Association, the American Chemical Society, Society of the Chemical Industries, American Institute of Chemical Engineers. He is a member of the chemical plant facilities industrial advisory committee of the War Production Board and consultant of the National Defense Research Committee.

He is a Pennsylvanian by birth—born in Philadelphia on April 6, 1903. He now resides in New York at Port Washington, L. I.

The award scroll was presented March 22 at a banquet highlighting the annual meeting of the Commercial Chemical Development Association. Mr. McClure spoke on that occasion on "Recent Case Studies in Chemical Development."

Robert W. Gaines has been appointed technical representative with the synthetic fibers department, Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corp., New York. Prior to this he was assistant department head of yarn development at the company's South Charleston, W. Va., plant. **Arthur L. Snyder** has also joined the synthetic fibers department.

William W. Ward has joined the Evans Research & Development Corp., New York, as research assistant.

J. G. Kirkwood has been elected chairman of the American Physical Society; **A. Kantrowitz** has been elected vice chairman; **J. H. McMillen**, secretary-treasurer.

Ogden FitzSimons has joined the Ciba Products Corp., Kimberton, Pa., as chief engineer. He was formerly with Monsanto Chemical Co.

E. Langford Jones has been named technical assistant in sales for the Virginia cellulose department of Hercules Powder Co., Wilmington. **Leon L. Bertram** succeeds Mr. Jones as chief chemist at the company's Virginia cellulose plant in Hopewell, Va.

Ernest O. Ohsol has been appointed manager of chemical process development of the chemical department of the General Electric Co., Pittsfield, Mass. He was formerly a development engineer with Standard Oil Development Co.

William P. Pennoyer has been made plant manager of the Stamford research laboratories of the American Cyanamid Co., New York. **William M. Bowes** has been made assistant plant manager.

J. C. Patterson has been elected president of the Industrial Unit Heater Association, Detroit. **H. S. Wheller** has been made vice president; **L. O. Monroe**, secretary-treasurer.

W. F. Crawford, president of Edward Valves, Inc., East Chicago, Ind., has been elected a director of the Central Scientific Co. of Chicago.

Roy D. Haworth, Jr., has been appointed manager of product development of the carbide alloys division of Allegheny Ludlum Steel Corp., Pittsburgh. He was formerly with Armour Research Foundation in Chicago as supervisor of abrasion research.

Carl S. Reed has been elected chairman of the board of directors of the Lummus Co., New York. **James F. Thornton** has been elected president.

W. H. Garrett, director of Monsanto Chemicals Ltd., London, has been awarded the medal of the University of Liverpool Chemical Society for 1950.

Carl S. Marvel, head of the University of Illinois organic chemistry department, has been chosen to receive the Willard Gibbs Medal by the Chicago section of the American Chemical Society.

C. S. Marvel

R. L. Demmerle

Richard L. Demmerle has been appointed Special Features Editor of *Chemical Engineering*, McGraw-Hill Publishing Co., New York. For the past four years he has been associate editor of *Chemical & Engineering News* and *Industrial & Engineering Chemistry* and was stationed in the New York offices of

(Continued)

(No. 12)

Adsorption Selectivity

The conditioning of an activated carbon to make it uniquely selective for a particular adsorbate is in general not possible, for three reasons. First, there is no satisfactory theory on adsorption from solution by which the correct conditioning of the carbon can be worked out. Second, in very few cases is there any information on the physico-chemical properties of the material to be selectively adsorbed. Third, the cost of producing "uniquely selective" grades would require pricing them at levels which would be prohibitive.

Where a degree of selectivity is desirable, it is frequently practical to modify the conditions of adsorption. For example, the best pH for adsorption is that at which the adsorbate is least soluble. If there is a choice of solvents, adsorption isotherms quickly indicate which solvent is best in a particular problem.

The technical staff of DARCO CORPORATION has an excellent record of working out optimum adsorption conditions in cooperation with DARCO users. When a problem in selectivity arises, the most probable path to a satisfactory solution of it lies in conferring with these specialists.

Write for the "Carbon Copy" Series.

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CORPORATION
60 East 42nd St., New York 17, N.Y.

NAMES IN THE NEWS, cont. . .

those American Chemical Society publications.

A. C. Finlay has been appointed assistant director of the biochemical research and production division of Chas. Pfizer & Co., Brooklyn, N. Y. Research personnel who have recently joined the division include **J. F. Snell, Richard N. Shoemaker, Arthur R. English** and **Samuel C. Beesch.**

John C. Treacy has been appointed instructor in chemical engineering at the University of Notre Dame, Notre Dame, Ind.

Donald W. Light has been appointed director of research for the Angier Corp., Framingham, Mass., manufacturers of industrial packaging papers.

D. W. Light

H. F. Werhane

Harold F. Werhane has been elected president of the Culligan Zeolite Co., Northbrook, Ill. He succeeds **Emmett J. Culligan,** the company's founder, who has been elected chairman of the board.

Earle W. Mills, Vice Admiral (Retired), United States Navy, has been elected president of Foster Wheeler Corp., New York. **David McCulloch** has been made chairman of the board.

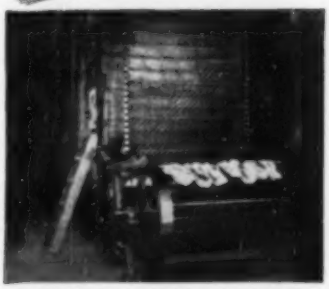
Thomas I. Crowell, Jr., and **Charles B. Cooke** have been elected vice presidents of Ford, Bacon & Davis Inc., New York.

O. S. Dollison has been elected vice president of the Lee Rubber and Tire Corp., Youngstown, Ohio. **E. M. Ikirt** succeeds him as general manager of the Republic Rubber Division.

M. K. Smith has been made director of the technical division, Baker Castor Oil Co., New York.

Joseph H. Reid, manager of the titanium division of National Lead Co., New York, has been elected a direc-

(Continued)



A Cambridge One Direction Weave Belt, chain driven and fitted with stiffening rods, carries raw wool through the continuous drying operation. The wide-open mesh permits free passage of the warm, dry air for fast, clean drying.

with *Cambridge*
WIRE BELTS

Cambridge Wire Belts are efficient workers in your field. They serve in heat, cold, corrosive and wet processes; through packaging and assembly operations—moving quickly or slowly at constant or varying speeds. Wherever a material can be processed during movement, a Cambridge belt can, and does, save time, money and floor space.

Cambridge offers you a modern engineering staff with experience in your field and skilled workmen to produce the right belt in the correct mesh and weave, metal or alloy to perform your operation better . . . for longer.

Consult your Cambridge representative—look under "Belting, Mechanical" in your Classified Telephone Directory or write direct.

FREE BOOK—Famous throughout industry as the most valuable reference work on belts and conveyor systems. Write for your free copy . . .

Cambridge Wire Cloth Co.
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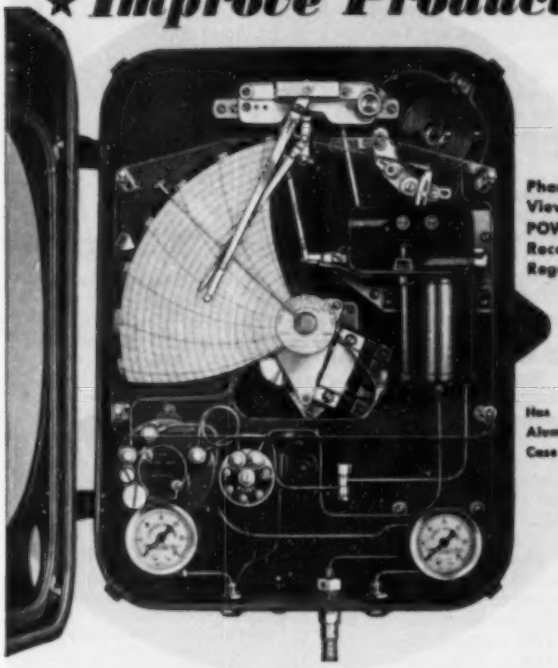
Wire cloth in rolls. | Also specialized wire fabrications

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

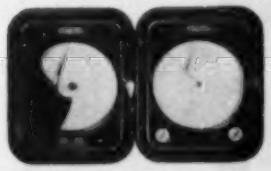
★REDUCE COSTS
★Improve Production



Phantom View of POWERS Recording Regulator

Has Aluminum Case

ABOVE: POWERS WET and DRY BULB RECORDING REGULATOR. Also available as a recorder only. Unit consists of two pen recording thermometer, water pan and motor blower causing sufficient circulation to give proper wet bulb readings.



ABOVE: POWERS TIME CYCLE RECORDING REGULATOR. Cam with cam follower operates steam control valve to correspond with any pre-determined time temperature schedule. Recording thermometer chart record provides a check on the operation of the control.

with precision control by—

POWERS

Air-Operated
INDICATING AND RECORDING REGULATORS

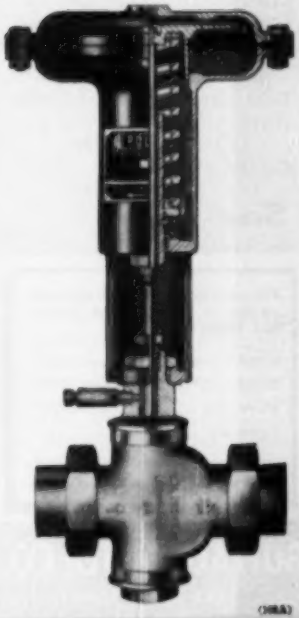
For TEMPERATURE • HUMIDITY • PRESSURE

End losses caused by OVER-heating of processes or operations requiring precise control. Install POWERS pneumatic regulators. Their accurate control helps to improve quality of products—speed up production and save steam wasted by overheating.

Variety of Models: Recording Thermometers; Recording Regulators; Indicating Regulators; Wet and Dry Bulb Recording Regulators; Time Cycle Recording Regulators; Master and Sub-Master Indicating and Recording Regulators, etc.
Write for Bulletin 370.

For Better Temperature and Humidity Control and valuable aid in selecting the right instruments for your requirements—phone or write our nearest office. There's no obligation. The Powers Regulator Co., 2718 Greenview Ave., Chicago 14, Ill. • 231 E. 46th St., New York 18, N.Y. • 1808 W. Eighth St., Los Angeles 5, Calif.

THE POWERS REGULATOR CO. • OFFICES IN 50 CITIES



(10BA)

ABOVE: POWERS FLOWRITE VALVE

Using the time-tested principles of Niagara Meter operation — but with stainless steel replacing bronze for corrosive-liquid measurement — Niagara Chemical Meters are built for liquids such as the following:

Sodium hydroxide Soap
Sulphuric acid (95-100%)
Fruit juices Vegetable juices
Acetic Acid Vinegar
Calcium hydroxide
Calcium chloride Alum

Send Coupon
for complete data!

Please send me full information on use of your Niagara Chemical Meter for:

Liquid .....
Temp.....°F. Pressure.....p.s.i.
Flow rate .....g.p.m.
Company .....
By .....
Address .....

BUFFALO METER CO.
2893 MAIN STREET
BUFFALO, N. Y.

NAMES IN THE NEWS, *cont. . .*

tor and member of the executive committee.

Lewis P. Tabor, senior research engineer in the Franklin Institute Laboratories for Research and Development, Philadelphia, has been elected chairman of the science and arts committee which is responsible for choosing the scientists to whom special institute medals are awarded each year.

Arlington Kunsman has been appointed assistant general manager of the newly-created film department of E. I. du Pont de Nemours & Co., Wilmington. He was formerly manager of the cellophane division of the rayon department.

Frederic W. Schuler has joined the National Research Corp., Cambridge, Mass., where he is engaged in metallurgical research.

Carl A. Houy has been appointed general superintendent of crude oil production for Deep Rock Oil Corp., Tulsa, Okla.

C. Kenneth Shuman, director of research and development for the Glidden Co.'s feed mill division in Indianapolis, has been selected by the Soya Food Research Council to visit Western Germany as a nutrition advisor to the German Food Administration.

William B. McFerrin has been appointed division executive vice president, and **Robert M. Briney** has been appointed division vice president in charge of wrought alloy products for the Haynes Stellite Division, Union Carbide and Carbon Corp., New York.

Herman Merker has been appointed president of the Pressed Steel Tank Co., Milwaukee, Wis.

James T. Eaton, manager of research for E. F. Houghton & Co., Philadelphia, has been elected to the board of directors. **William F. MacDonald** has been elected president.

G. F. A. Burgess, a joint managing director of the British Metal Corp. Ltd., has been made chairman of the International Tin Research & Development Council, which controls the Tin Research Institute. He succeeds **V. A. Lowinger.**

W. M. Hurley has been appointed works manager of the East Alton

(*Continued*)

Safety Goggles
Respirators
Acitex Hoods
FOR SAFETY... USE CESCO
The name CESCO is your assurance of dependable safety equipment
These are only a few of CESCO's more than 200 products
Face Shields
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Send for catalog showing CESCO's complete line of safety equipment
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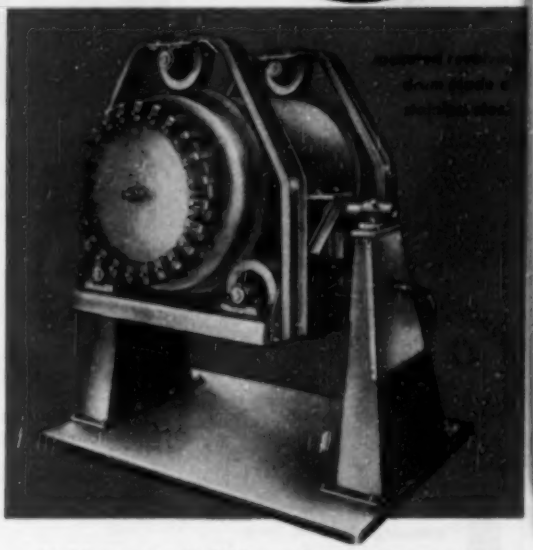
BACK IN THE 1880's

WHEN THE FIRST
KODAK CAMERA
WAS INVENTED

Koven

WAS MAKING INDIVIDUALIZED
CHEMICAL EQUIPMENT



Mr. & Mrs. John Q. Public got their first chance at amateur photography when George Eastman invented a portable film camera. At the same time, KOVEN was designing and building individualized chemical equipment to fit in with the needs of America's fast-growing chemical industry. Each KOVEN unit is planned and built to solve a specific problem; thereby assuring more efficient and less costly production. Follow the lead of the nation's top chemical plants. Call or write KOVEN today for catalog describing facilities in our two plants.

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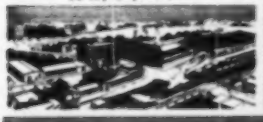
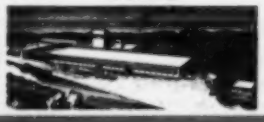
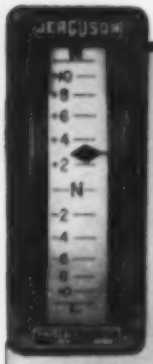




KOVEN equipment in all commercial metals and alloys includes: pressure vessels, extractors, mixers, stills, condensers, kettles, tanks, chutes, containers, stacks. Fabrication to A.S.M.E. Code Par. U-68 and U-69 a specialty.

KOVEN FOR INDIVIDUALIZED CHEMICAL EQUIPMENT SINCE 1881



Assures Positive Distance Reading of Liquid Levels

JERGUSON TRUSCALE GAGE

THE modern design JERGUSON TRUSCALE GAGE gives new accuracy for reading of liquid levels in boilers, deaerating tanks, etc.

Here is the distance reading gage which incorporates all of the newest engineering features! The Jerguson Truscale has exceptional sensitivity, with the ability to register changes as small as ½ of 1% of range! The translucent dial scale is clearly lighted from behind, and is easy to read.

The Truscale Gage may be equipped with positive alarm system. Lights flash and horns sound at specified key points when liquid level falls dangerously low or rises too high. Foolproof anti-surge mechanism for use on ships. Available for panel, pedestal, or wall mounting. It will pay you to investigate.

JERGUSON TRULEVEL GAGE

Hydrostatic type distance reading gage with inverted U-tube manometer. Water level always visible with space above showing brilliant red. Built-in feature makes possible checking of gage accuracy in few seconds.

Write today for free illustrated DATA UNITS on Jerguson Truscale and Trulevel Gages

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Gages and Valves for the Observation of Liquids and Levels

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100 Follaway, Somerville 45, Mass.
Representatives in Major Cities
Phone Listed Under JERGUSON

NAMES IN THE NEWS, cont. . .

plant of Olin Industries, Inc. He will direct the manufacturing of the plant's sporting ammunition, brass and explosives divisions.

W. B. Holton, Jr., president of Walworth Co., New York, has been re-elected president of the Valve Manufacturers Association, New York. **Ernest Cochran** and **Charles W. Burrage** have been re-elected vice presidents. **Wayne Young** was elected a vice president and **George A. Cooper** was re-elected secretary-treasurer.

Herschel H. Cudd has been appointed head of the chemical sciences division of the Georgia Tech Engineering Experiment Station.

H. C. Cudd

E. F. Wagner

Edward F. Wagner has been appointed head of the technical service department of Witco Chemical Co., Chicago.

J. Edgar Hill has been appointed factory superintendent of National Adhesives (Canada) Ltd., Montreal.

Carlton H. Rose has joined the staff of the National Lead Co. office in Washington, D. C. He will continue as head of the company's specifications department.

A. J. Granata has been made vice president in charge of operating and engineering for the Pure Carbonic Co., a division of Air Reduction Co., New York. **L. F. Kilmarx** has been made vice president in charge of sales.

Arthur F. Glos has been put in charge of the analytical laboratory of the Hilton-Davis Chemical Co. division of Sterling Drug Inc., Cincinnati, Ohio. **Walter Steele** has succeeded him as director of pigment research and raw material testing for the pigment department.

H. B. Hurley has been named vice president of Republic Natural Gas Co., Dallas. He was formerly assistant regional general manager of

(Continued)

Why pay more? Why take less?

STAINLESS STEEL and MONEL UTENSILS by METALSMITHS

Finest quality utensils, durably fabricated by specialists in corrosion-resisting metals. Full line, prompt shipment, attractive prices.

• WRITE FOR ILLUSTRATED PRICE LIST

NEW! Stainless Steel Scoops

Round-bottom, 304 stainless steel. No joints, corners or rough spots to trap materials. ½ pt., 1 pt., 1, 2, 4 qt. sizes. Write for economical prices.

METALSMITHS

Division of
Orange Roller Bearing Co., Inc.
564 White Street
Orange, N. J.

Only 3 days

From order to Shipment...

Special Order By Telephone

ONE AMMONIUM NITRATE HEAT EXCHANGER 100% STAINLESS STEEL
(ASI TYPE 347)

WESTERN does it in 13 BIG STEPS in 3 DAYS

FRIDAY, March 10

4:00 PM—Phillips Chemical Company, Bartlesville, places rush order by phone.

5:00 PM—ASI type 347 stainless steel ordered by phone from Metal Goods Corporation, St. Louis warehouse.

8:00 PM—Unit put on drafting board; rough draft finished and blueprinted by 11 p.m.

SATURDAY, March 11

8:00 AM—Draft personally carried to Bartlesville for approval.

12:00 NOON —Steel delivered to Frisco in St. Louis by Metal Goods.

3:00 PM—Finished drawing completed in Tulsa.

SUNDAY, March 12

8:00 AM—Materials received in Tulsa via Railway Express.

9:00 AM—Begin machining phase.

4:00 PM—Finish machining all parts — 7 hours.

MONDAY, March 13

7:00 AM—Welding operations begin.

8:00 AM—Assembly work begins.

12:00 NOON —Assembly completed; unit tested hydrostatically and pneumatically.

3:00 PM—Finished Stainless Steel Exchanger shipped to Phillips Chemical, Etter, Texas.

MATERIAL FROM ST. LOUIS

APPROVAL FROM BARTLESWILLE

FABRICATION IN TULSA

DELIVERY TO ETTER, TEXAS

Making final check of specifications before shipment from Western shops

The same technical skilled attention to detail and streamlined production facilities which satisfactorily produced this rush-order on chemical process equipment is applied to all Western Heat Transfer equipment, whether in the chemical, petroleum or pipeline industries.

WESTERN
HEAT EXCHANGERS

Manufactured by

WESTERN SUPPLY COMPANY

P.O. BOX 1868 TULSA, OKLAHOMA

SALES OFFICES — DALLAS — HOUSTON

SAN FRANCISCO REPRESENTATIVE: TRIDENT ENGINEERING COMPANY

FORMALDEHYDE

produced in the Chicago area for the Great Lakes Region and the Middlewest

MADE FROM
OUR OWN
RAW MATERIAL

Available in

TANK CARS
and
DRUMS

let us
tell
you more

SPENCER

SPENCER CHEMICAL COMPANY

Executive & Sales Offices: Dwight Bldg., Kansas City 6, Mo.

NAMES IN THE NEWS, cont. . .

Continental Oil Co., Fort Worth.

Frank C. Anderson has been appointed assistant to the vice president and assistant secretary of the Gulf Oil Corp. and Gulf Refining Co., Houston.

L. Kermit Herndon, professor of chemical engineering at Ohio State University, has been appointed director of research for Mathieson Chemical Corp., New York. He will continue to hold his university post while completing graduate research assignments and supervising Mathieson's Ohio State University Research Foundation project.

L. K. Herndon

K. Finsterbusch

Karl Finsterbusch, T. C. Williams and **Lockwood J. Towne** have been elected to the board of directors of Stone & Webster Engineering Corp., Boston. All are vice presidents. Mr. Finsterbusch is responsible for process engineering work; Mr. Williams for construction operations; Mr. Towne, also construction manager, has the executive direction of construction projects in this country and Canada.

Earle S. Smith has been made chairman of the Toledo Porcelain Enamel Products Co., Toledo. **Erwin L. Adams** has succeeded him as president.

Jess E. Adkins has been appointed editor of the *Journal of Petroleum Technology*, monthly publication of the petroleum branch of the American Institute of Mining & Metallurgical Engineers.

Robert M. Crawford, formerly vice president of Durez Plastics & Chemicals, North Tonawanda, N. Y., is now engaged in business for himself as a consulting chemical engineer in Buffalo, N. Y.

Britton Chance, director of the Eldridge Reeves Johnson Foundation for Medical Physics of the University of Pennsylvania, has been granted the Paul-Lewis Laboratories

(Continued)

The Liquid Plastic that STOPS CORROSION

PRUFCOAT

can help save your share of this huge bill

COST OF CORROSION TO U.S.

annual cost . . . over $5,500 million

PROOF against Acids, Alkalis, Salt, Oil and Water

*Article in C. & E. News Vol. 27 — 839

"Prufcoat proven superior to all other coatings we have tested" . . . writes one of America's largest chemical companies, after eight years' experience with Prufcoat. And this is just one of many reports on file testifying to the effectiveness of Prufcoat's famous liquid plastic formulations in controlling corrosion caused by chemical agents such as these:

Acetic Acid	Muriatic Acid
Alcohols	Nitric Acid
Bleach Solutions	Oleic Acid
Calcium Chloride	Oleum
Chlorine	Phosphoric Acid
Cyanides	Salt Solutions
Formaldehyde	Sugar
Hydrofluoric Acid	Sulfonated Oils
Lactic Acid	Sulphuric Acid
Lubricating Oils	Sodium Hydroxide

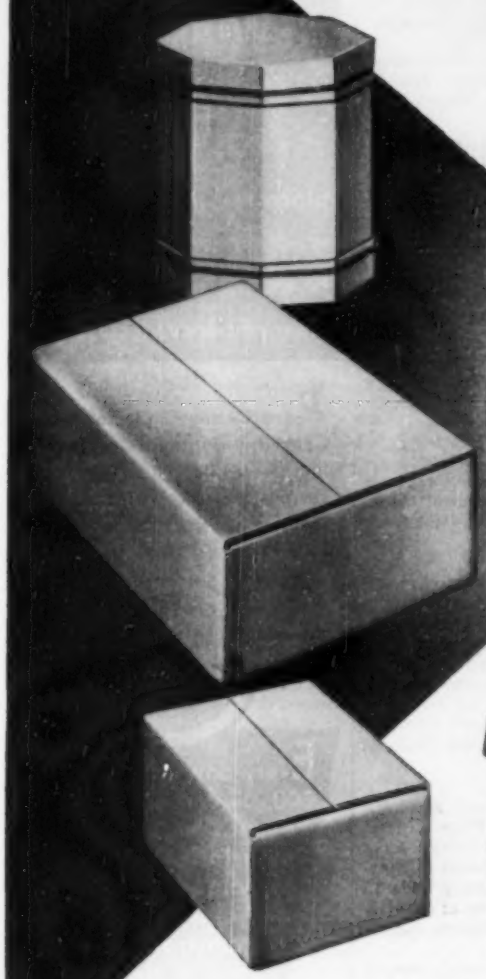
Send today for a *Prufcoat PROOF Packet*. Contains in one easy-to-file folio outside laboratory tests, case histories, and Prufcoat Protecto-Graph Plan for analyzing your own painting maintenance costs. *Write Prufcoat Laboratories, Inc., 63 Main St., Cambridge 42, Mass.*

SAVES More because it PROTECTS More

8 Attractive Colors that Apply Like Paint to Masonry, Metal, Wood

MINIMIZE

Your Shipping Risks with



Gaylord Boxes

When you use Gaylord Protective Packaging, you know that your product is receiving special protection against the hazards of shipping. This extra protection is your insurance against annoying damage and the loss of customer goodwill.

To put Gaylord Protective Packaging to work for you just call the nearest Gaylord sales office.

GAYLORD CONTAINER CORPORATION, General Offices: ST. LOUIS

CORRUGATED AND SOLID FIBRE BOXES ●
FOLDING CARTONS ●
KRAFT GROCERY BAGS AND SACKS ●
KRAFT PAPER AND SPECIALTIES ●

New York • Chicago • San Francisco • Atlanta • New Orleans • Jersey City • Seattle
Indianapolis • Houston • Los Angeles • Oakland • Minneapolis • Detroit • Jacksonville
Columbus • Fort Worth • Tampa • Cincinnati • Dallas • Des Moines • Oklahoma City
Greenville • Portland • St. Louis • San Antonio • Memphis • Kansas City • Bogalusa
Milwaukee • Chattanooga • Wallaco • New Haven • Appleton • Hickory • Greensboro
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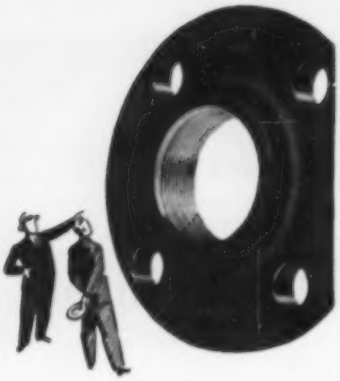
GA-248



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CAMCO

for Extra Value

For Better Performance Order All Companion and Slip-on STAINLESS STEEL FLANGES Up To and Including 2" I.P.S. Machined from Drop Forgings They COST NO MORE than Competing Cast Flanges

SAVE WITH CAMCO

- Cylindrical Fittings up to and including 2" I.P.S. are machined from bar stock.
- Elbows and Tees up to and including ¾" I.P.S. are machined from drop forgings.

Orders filled promptly from stock from ⅛" to 4" I.P.S. inclusive in types 304, 316 and 347 stainless steel.

If your local jobber cannot supply you with CAMCO fittings, write today for name of nearest distributor.

CAMCO PRODUCTS INC.

25 Fox Street

New Haven 13, Connecticut

NAMES IN THE NEWS, cont. . .

Award in Enzyme Chemistry by the American Chemical Society.

Austin W. Boyd, Jerome T. Coe and **James R. Donnalley, Jr.**, of the chemical department of the General Electric Co., Pittsfield, Mass., have received a joint Coffin award, their company's highest honor to employees. They were honored for their work on an improved reactor for the production of silicone chemicals.

Hiram B. Young has been made works manager of the Hooker Electrochemical Co. plant in Niagara Falls, N. Y.

B. G. Krause, manager, Air Controls Inc., Cleveland, has been elected president of the Propeller Fan Manufacturers' Association, Detroit. **W. H. Holt** has been made vice president and **L. O. Monroe**, secretary-treasurer.

Anthony J. Cofrancesco has joined General Aniline & Film Corp. as a process development chemist at the Rensselaer plant. He was formerly chief chemist at the Garwin Chemical Co.

Frederick G. Weigand has been appointed resins insulation engineer in the chemical department of the General Electric Co., Pittsfield, Mass.

Ralph C. Persons has been elected a director and vice president of the Sun Chemical Corp. He will continue as general manager of the Geo. H. Morrill Co. division and also be in charge of the company's graphic arts group.

Merle E. Sibert has joined Horizons Inc., Princeton, N. J.

John E. Gurvin has been appointed plant engineer at the Everett, Mass., plant of Monsanto Chemical Co.'s Merrimac Division. **James H. Saunders** has been made group leader in the research department of the phosphate division in Anniston, Ala.

Lloyd G. Alexander, formerly research assistant professor in the engineering experiment station of the University of Illinois, has been appointed assistant professor of chemical engineering at the University of Oklahoma, Norman.

John H. Smith has been elected president of the General Electric X-Ray Corp., Milwaukee. He succeeds

(Continued)

If your plant requires

- DIRECT HEATING OF VAPORS
- DIRECT HEATING OF LIQUIDS
- DOWTHERM INDIRECT HEATING
- STEAM GENERATORS
- STEAM SUPERHEATERS
- WASTE HEAT BOILERS

place the selection of the specific type in specialized hands . . . and obtain optimum efficiency.

Petro-Chem Development Company engineers are heating specialists . . . they can supply the whys and wherefores of indirect versus direct heating and the economics of both.

Every day more than 600, oil and gas fired, Petro-Chem Iso-Flow* installations in the petroleum, chemical and allied industries, demonstrate the efficiency of their design and installation.

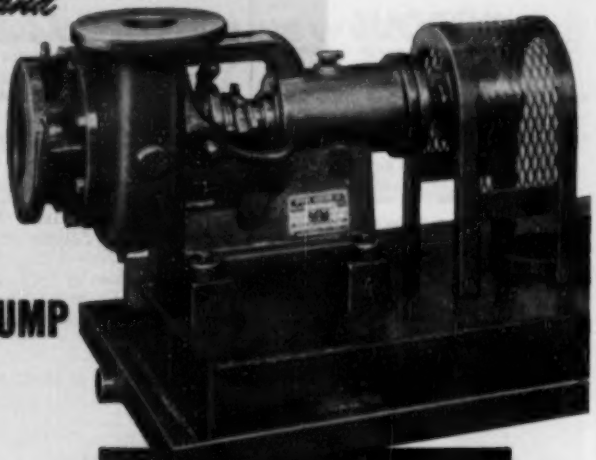
*Patents issued and pending

PETRO-CHEM DEVELOPMENT CO., INC.
120 East 41st Street, New York 17, N. Y.

Representatives:
Bethlehem Supply, Tulsa and Houston • Flagg, Brackett & Durgin, Boston • D. D. Foster, Pittsburgh • Faville-Levally, Chicago • Lester Oberholt, Calif.

It's ruggedly built... and moderately priced!

PUT THIS WELL ENGINEERED GENERAL PURPOSE PUMP TO WORK FOR YOU



BJ FIGURE 1025

GENERAL PURPOSE PUMP

THE BJ FIGURE 1025—a horizontal, single-stage, end suction centrifugal pump — is a sound recommendation for general purpose pumping in your plant. Incorporating BJ *engineered* advantages and ruggedly built to give long, dependable service, it is also priced favorably. Take a look at these design, construction and capacity specifications:

CONSTRUCTION: Standard construction is cast iron with bronze fittings. It can also be supplied in all iron construction or in corrosion-resistant or other special materials as desired.

BALL BEARING BRACKET: Pump case is securely bolted to a compact rigid bearing bracket. Two oil lubricated single-row ball bearings support shaft without deflection.

STANDARD STUFFINGBOX: The standard stuffingbox has more than the usual number of packing rings generally found in this class of pump. It provides 9 in the standard unit or 7 when cage ring is supplied. A water-jacketed stuffingbox is also available at additional cost.

NEW BJ MECHANICAL SEAL: The Figure 1025 may be secured with the new BJ Mechanical Seal which replaces the standard packing in the stuffingbox. This mechanical seal protection is recommended for uses where extra demands are made on stuffingbox performance and where positive protection against contamination of pumped liquid is a factor.

GENERAL SPECIFICATIONS

Pump Sizes	1¼, 1½, 2, 2½ and 3* inches
Capacity Range	10-600 gpm
Head Range	20-340 ft.
Temperature Limit	350° F.

*Double volute case on this size.

Find out how the BJ Figure 1025 Pump – either with standard stuffingbox and packing, or with BJ's new mechanical seal—can handle your general purpose pumping with moderate first cost and low operating cost. Send coupon below for full details.

Byron Jackson Co.

Since 1872

P. O. Box 2017 Terminal Annex, Los Angeles 54, Calif.

OFFICES IN PRINCIPAL CITIES

BJ PUMP DIVISION DEPT. 31

Please send me more information on the BJ Figure 1025 Pump.

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ADDRESS _____

City _____ State _____

Schumacher

POROUS STONES

A complete line of perfect filter media for all chemical, physical, and thermal requirements.

AEROLITH and SILEXITH *for Acid requirements*

CARBO *(pure carbon) for Alkalis*

BROWN-YELLOW *for extreme thermal conditions*

B/D MASSES *for sterile filtration*

BRANDOL *for biological sewage and waste water treatment*

DIAPOR *for diaphragms in electrolytic and electrochemical processes.*

Schumacher's Porous Stones offer most suitable filter materials for all specific requirements in the filtration of liquids, gases, and air.

Pressure Filter Units for purification of liquids, gases, and air. Special materials for sterile and water purification.

Schumacher's Filter Tubes and Candles for catalytical contact processes and in fluid catalytical operations.

Schumacher's Aeration Plates for sewage and water treatment, activated sludge process, for pneumatic conveying of powdered materials and in silos.

Porous materials for diffusion reactions between gases and liquids, for carbonization, oxydation, foam productions, etc.

Schumacher's ***Porous Stones*** *are of high porosity, great strength, and offer several ranges of permeability. They are available in a large variety of shapes, such as plates, cylinders, candles, columns, discs, and special forms made to specification.*
More than a hundred years of specialized experience and service in filtration.
Catalogs gladly mailed. Submit your filter problems to us. Samples, as well as engineering services, available.

Schumacher'sche Fabrik,
Bietigheim, Germany

represented in U.S.A. by
CHEMTECH PRODUCTS CORPORATION
62 William Street
New York 5, N. Y.

NAMES IN THE NEWS, cont. . .

John H. Clough who has been made chairman of the board.

Joseph Slepian, associate director of the research laboratories of the Westinghouse Electric Corp., Pittsburgh, has been awarded the honorary degree of Doctor of Science by the University of Leeds, London, England.

Robert H. Brown, chief of chemical metallurgy at the research laboratories of the Aluminum Co. of America in New Kensington, Pa., has been chosen by the National Association of Corrosion Engineers to receive the Whitney Award for 1950.

R. C. Ernst, dean of the Speed Scientific School and director of the University of Louisville Institute of Industrial Research, Louisville, Ky., has been elected second vice president of the Kentucky Society of Professional Engineers.

Thor H. Westby has retired from his position as senior engineer in charge of Sears, Roebuck and Co.'s metallurgical laboratory in Chicago.

Berton E. Rogers has been appointed works manager of the Winchester Repeating Arms Co. division of Olin Industries, Inc., New Haven, Conn.

Thomas M. Rector, vice president of General Foods Corp., New York, has been chosen to receive the Nicholas Appert award by the Institute of Food Technologists, Chicago.

Francis C. Frary, director of research, Aluminum Co. of America, Pittsburgh, Pa., has been awarded the James Douglas Metallurgical Medal for 1950 by the American Institute of Mining and Metallurgical Engineers.

William Miles has been appointed supervisor in charge of the newly established certified food color plant of the Hilton-Davis Chemical Co. division of Sterling Drug Inc., Cincinnati.

Allen T. McKay has been elected vice president in charge of sales at the juice industries division offices of Clinton Foods Inc., Dunedin, Fla.

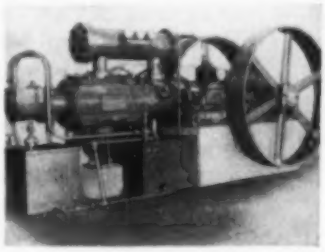
Thomas G. Flavelle, director and assistant secretary of Innis, Speiden & Co., New York, has retired from

(Continued)

WHEN YOU THINK OF

HIGH PRESSURE
THINK OF
NORWALK
COMPRESSORS

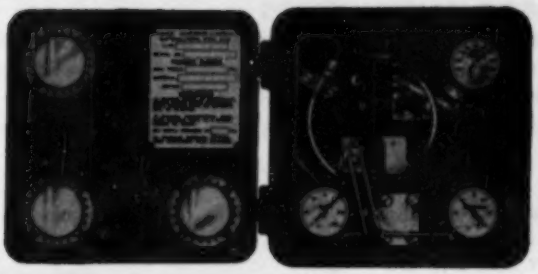
3 STAGE COMPRESSOR



This Norwalk three stage compressor is used extensively in the CO_2 field, processes demanding continuous operation of equipment for extended periods. Norwalks are precision built for such difficult assignments. Write us for further information.

NORWALK
COMPANY, INC.
ESTABLISHED IN 1864
SOUTH NORWALK, CONNECTICUT

Your Favorite Dependable WIZARD...in a new gas-tight weather-proof case for flush or surface panel mounting



Type 4100U remote mounting Wizard with cover open.

FISHER WIZARD PILOT SERIES 4100U

Side view Type 4100U for flush mounting.

Side view Type 4100U for surface mounting.

Universal case adapts Wizard to flush or surface panel mounting and also to valve yoke mounting.

Available with either bellows or Bourdon tube measuring element, for pressures from inches W. C. to 10,000 PSI.

Simple knob adjustment for controlled pressure setting, indicated on calibrated dial.

WRITE TODAY FOR BULLETIN 94

FISHER GOVERNOR CO.
MARSHALLTOWN, IOWA

Problem-Corroded, plugged-up,

Solution-BS&B SAFETY HEADS!

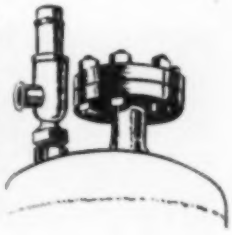
BS&B SAFETY HEADS are the answer to your relief valve problem. These precision devices give extra protection to relief valve operation. They can be used: (1) Under your existing relief valve (2) As secondary relief devices (3) As sole pressure relief devices (4) At outlet of certain types of relief valves.

1. *Under your existing relief valve*

A SAFETY HEAD under your relief valve isolates the valve from vessel contents. Leakage through the valve is halted until the SAFETY HEAD rupture disc is burst by over-pressure. For this use a bleed line must be installed in the chamber between the valve plug and the rupture disc, enabling the operator to determine if rupture disc is intact.

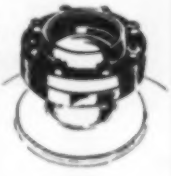
2. *As a secondary relief device*

. . . when operation is close to the relief valve setting. As a secondary relief device, the rupture disc can be rated much higher than the valve setting. If the valve fails to function or capacity inadequate you are certain of positive protection when pressure rises to the predetermined bursting pressure of the disc.



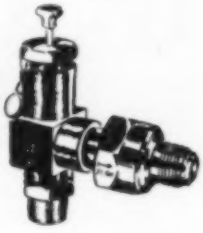
3. *As sole pressure relief device*

This installation is used when it is necessary to have a shut-off or when materials handled are not toxic or flammable.



4. *At outlet of certain types of relief valves*

A SAFETY HEAD at the relief valve outlet will stop leakage until pressure builds up to the designed bursting pressure of the rupture disc. In this use the valve design must not permit an increased pressure setting of the valve due to pressure in the chamber between the rupture disc and the valve plug. Not recommended where corrosive or viscous materials might contaminate internal parts of the valve.



How—New Catalog!

It's now being prepared . . . the new BS&B SAFETY HEAD catalog. Gives you all the facts . . . all the answers to your questions about these amazing safety devices. Reserve your copy now by mailing the coupon on opposite page!

FREE ANALYSIS!

Jim Myers, SAFETY HEAD Sales Manager will have a BS&B engineer analyze your pressure relief problems and submit suggestions to you WITHOUT COST OR OBLIGATION. Mail the coupon on opposite page or call GRand 6700, Kansas City, Mo. Do it now!

leaky relief valves...

A typical BS&B SAFETY HEAD installation is shown above. The white circle surrounds a 600# Union type Safety Head with a Monel metal rupture disc rated 400# bursting pressure at 150 degrees F (275# operating pressure) installed on an Ingersoll-Rand two-stage hydrogen compressor.

The pre-determined bursting pressure is established with a safe margin above operating pressure. Correct element resistant metals are used in fabrication of the rupture discs.

BS&B SAFETY HEADS are rapidly becoming standard installations on compressed gas and air equipment. Once the complete BS&B SAFETY HEAD story is understood... for unfailing protection to both property and the lives of personnel... there is little delay in order placing. Investigate BS&B SAFETY HEADS at once.

Safety Head Dept.
SPECIAL PRODUCTS DIVISION
Black, Sivalls & Bryson, Inc.

BLACK, SIVALLS & BRYSON, INC.,
720 Delaware, 1-54 Kansas City, Mo.

☐ Please reserve for me a copy of the new BS&B SAFETY HEAD catalog.

☐ Please have a BS&B SAFETY HEAD engineer analyze my relief problem, without cost or obligation to me.

Name_____

Firm_____

Title_____

Address_____

City_____ Zone____ State_____

BS&B SAFETY HEADS

NAMES IN THE NEWS, cont...

active management. He was in charge of the gum and wax division and will continue to serve in an advisory capacity and as a director of the company.

Harry A. Dennis has been made manager of sales for the stainless and alloy steels division of Graver Tank & Mfg. Co., East Chicago, Ind.

Herbert H. Woodman, president of Interchemical Corp., has accepted the chairmanship of the chemical division of the Legal Aid Society, New York.

Kenneth S. Pitzer, director of research of the United States Atomic Energy Commission, Washington, D. C., has been selected by the American Chemical Society in Houston, to receive the Precision Scientific Co. Award in Petroleum Chemistry.

Colby M. Chester has been elected chairman of the board of Manning, Maxwell & Moore, Inc., Bridgeport, Conn. **Robert R. Wason** has been reelected president.

John A. Derry has been appointed executive officer of the Division of Biology and Medicine, Atomic Energy Commission, Washington, D. C.

Stanley deJ. Osborne has been appointed vice president and treasurer of Mathieson Chemical Corp., Baltimore, Md. He succeeds **D. P. Morgan** who has been named vice president, director of the development department, New York.

Richard R. Blair has been appointed technical representative, rubber pigments, for the Columbia Chemical Division of Pittsburgh Plate Glass Co. His headquarters will be in Chicago.

Alvin C. Ash has been appointed technical sales service representative of Pennsylvania Salt Mfg. Co. of Washington's agricultural chemicals division. He will be located at the company's plant in Tacoma.

R. W. Deemer has been appointed production manager of the Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown, Ohio.

Robert R. Spencer has been named to represent the general chemical sales division of Dow Chemical Co., Midland, Mich., in Missouri, Kentucky, Tennessee, southern Illinois, south-

(*Continued*)

THIS MORE EFFICIENT PLANT

BUILT BY BLAW-KNOX!

Completed on schedule at less than cost estimate

Blaw-Knox has had wide experience in the design, construction and equipping of plants for:

CHEMICAL MANUFACTURING
•
CHLORINE AND CAUSTIC SODA PRODUCTION
•
EXTRACTION OF FATS
•
FAT SPLITTING
•
FATTY OIL REFINING
•
FRACTIONATION OF FATTY ACIDS
•
GAS DEHYDRATION
•
HARDBOARD MANUFACTURE
•
LIQUEFIED GAS STORAGE
•
NATURAL GASOLINE PRODUCTION
•
RESIN AND PLASTICS MANUFACTURE
•
SOLVENT RECOVERY
•
SYNTHETIC ORGANIC CHEMICAL PLANTS
•
...AND OTHER PROCESSES AND OPERATIONS

Based on studies of the Carborundum Company's eastern plant, Blaw-Knox engineers planned a modern production unit to take advantage of new techniques, and to utilize the natural advantages of a Pacific Northwest site. The plant shown above was designed, built and *equipped in its entirety* by one of the few firms capable of such undivided responsibility—Chemical Plants Division.

To the chemical, food and other specialized manufacturing Blaw-Knox offers expert comprehensive services that include engineering, procurement and erection of complete plants on schedule.

CHEMICAL PLANTS

DIVISION OF BLAW-KNOX CONSTRUCTION COMPANY

321 PENN AVE., PITTSBURGH 22, PA.

ern Indiana and northern Mississippi. **A. L. Dietzel** has been made the agricultural chemical department's representative in Missouri, Oklahoma, Kansas, Colorado and New Mexico. Both will work out of the St. Louis office.

OBITUARIES

Thomas Ray, 83, died in Manistee, Mich., February 1. He was known for his work on the use of the salt evaporation process in iron works and was formerly president of the Manistee Iron Works.

Monroe J. Bahnsen, 43, director of chemical research of Ferro Enamel Corp., Cleveland, died February 4.

Charles E. Scheuring, 62, president and co-founder of the Emerson-Scheuring Tank & Mfg. Co., Indianapolis, died on February 15.

J. C. Nichols, 69, who was one of the founders of the Midwest Research Institute, died February 16.

Frank E. Dodge, 83, chemical engineer known for his work on the recovery of coal byproducts, died at Rockville Center, N. Y., February 17.

Henry F. Leopold, 63, plant superintendent for the Southern Extract Co., died in Knoxville, Tenn., February 20. Several of his inventions are part of the company's paper processing technique.

Richard B. Harrison, 52, consulting engineer in the plastics industry and former vice president of the Plaskon Division of the Libbey-Owens-Ford Glass Co., died in Chicago February 21.

Arthur E. Gibbs, 74, died at Summerville, S. C., March 2. Until his retirement in 1946, he was with the Pennsylvania Salt Mfg. Co. where he invented and developed the Gibbs cell for the electrolytic production of chlorine, caustic soda and hydrogen from common salt brine.

Horace W. Gillett, 66, former director of Batelle Memorial Institute, died near Nicholasville, Ky., March 3. He was the inventor of numerous metallurgical processes.

Henry E. Perry, president of Commercial Solvents Corp., New York, died March 15. He had been with Commercial Solvents since 1922.

A Headline that is also a Helpline!

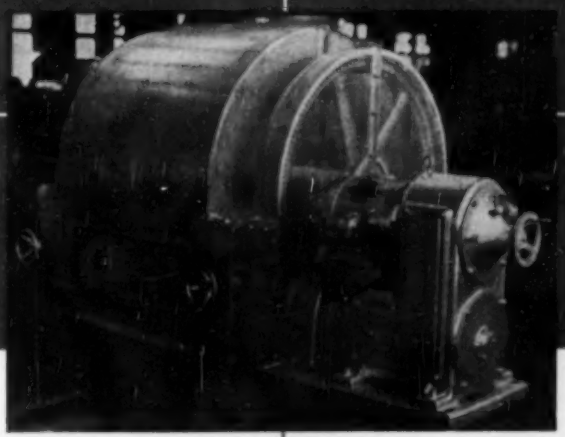
1. **BUFLOVAK FLAKERS**
2. **Make a product ready for use**
3. **Increased production**
4. **Lower production costs**
5. **Eliminate hazards**
6. **Special types flake difficult products**

1. A continuous and profitable method for cooling and flaking chemicals.
2. A direct method of converting hot or molten liquids into a finished product, easily packaged and conveniently used by the consumer.
3. Greater capacity results from the increased heat transfer obtained by an improved and uniform distribution of the coolant.
4. The use of BUFLOVAK Flakers cuts costs by eliminating hand labor and grinding of the finished product.
5. Enclosed type Flakers eliminate dust and toxic hazards.
6. Special types are available for difficult processes, including Twin and Double Drum for products with high melting points. Conditioning rolls simplify flaking products to supercooling.

Send for Catalog No. 352

Buflovak Equipment

DIVISION OF BLAW-KNOX CO. 1581 FILLMORE AVE., BUFFALO 11, N. Y.



BUFLOVAK BUILDS

EVAPORATORS
Low Temperature
By-Product Recovery
Chemicals
Food Product
Crystallization

DRYERS
Vacuum Double Drum
Vacuum Rotary
Pilot Plant
Atmospheric

PROCESSING KETTLES
Mixers
Impregnators
Dopp Kettles
Solvent Recovery & Distillation Equipment

P.S

BUFLOVAK RESEARCH and TESTING LABORATORY

To assist you in the solution of processing problems, Buflovak offers the facilities of its Research and Testing Laboratory... where small scale experimental units show you, *before you buy*, the commercial possibilities, data on production cost, and characteristics of the finished product.

IF YOU USE OR SPECIFY

SPRAY NOZZLES

You will find these free bulletins helpful

Send today for these Binks technical bulletins. Check those in which you are interested.

☐ **Bulletin 10**—Small and medium capacity Rotojet nozzles for air washing as well as applying rust-proofing, cleaning, and rinsing solutions to metal surfaces. Hollow-cone spray pattern.

☐ **Bulletin 11**—Nozzles for brine spraying operations.

☐ **Bulletin 12**—Medium and large capacity Rotojet nozzles for chemical processing, metal cleaning and treating.

☐ **Bulletin 13**—Large capacity one-piece Rotojet nozzles for use where a large volume of liquid is handled... spray ponds, water cooling.

☐ **Bulletin 14**—Nozzles for metal cleaning operations.

☐ **Bulletin 16**—Pneumatic Atomizing Nozzles for humidifying and spraying water, chemical solutions, oil, etc. in a completely atomized form.

☐ **Bulletin 19**—Spra-Rite Nozzles, vane-type, producing uniform, full-cone spray for industrial processes such as air and gas washing.

☐ **Bulletin 20**—Atomizing Nozzles for maximum fluid breakup in applications requiring diffusion of liquids.

There's a Binks spray nozzle for every spray job.

Binks MANUFACTURING COMPANY

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REPRESENTATIVES IN ALL PRINCIPAL CITIES

INDUSTRIAL NOTES

NEW FACILITIES

H. K. Porter Co., Pittsburgh, Pa.—A stock carrying branch in Pittsburgh for its Quaker Rubber Corp. division. H. M. Sossaman heads the branch.

Reliance Electric & Engineering Co., Charleston, W. Va.—A sales office in Charleston, W. Va., under the management of William C. McConnell.

Aluminum Co. of America, Pittsburgh, Pa.—A new division for the rolling of magnesium sheet at its New Kensington, Pa., works.

Bechtel Corp., Los Angeles—A mid-continent headquarters in Tulsa, Okla.

Celanese Corp. of America, New York—Bulk terminal facilities at Carteret, N. J., for the distribution of methanol produced at the company's Bishop, Tex., plant.

A. O. Smith Corp., Milwaukee—Manufacturing and supply facilities to enlarge service to motor customers throughout the country. They have contracted with Whirl-A-Way Motors, Inc., Tipp City, Ohio, to manufacture their fractional horsepower motors to specification to serve the eastern states.

General Controls, Glendale, Calif.—A branch office in Newark, N. J., under the management of William Buck.

Arnold, Hoffman & Co., Providence, R. I.—Additional research and sales service laboratory facilities for dyestuffs and textile chemicals.

Bridgeport Brass Co., Bridgeport, Conn.—A district sales office in Dallas, Tex., under the direction of B. M. Neilson.

United States Steel Corp., Chicago—An addition to the No. 5 powerstation of the South Chicago works of its subsidiary, Carnegie-Illinois Steel. To be completed early in

(*Continued*)

OLDBURY
ELECTRO-CHEMICAL COMPANY

PHOSPHORUS (Yellow or White)	PHOSPHORIC ANHYDRIDE
PHOSPHORUS OXYCHLORIDE	PHOSPHORIC ACID
PHOSPHORUS TRICHLORIDE	SODIUM CHLORATE
PHOSPHORUS PENTACHLORIDE	POTASSIUM CHLORATE
PHOSPHORUS PENTASULFIDE	POTASSIUM PERCHLORATE
PHOSPHORUS SESQUISULPHIDE	HYPOPHOSPHITES
AMORPHOUS PHOSPHORUS	OXALIC ACID (Powdered or Crystal)

ZINC PHOSPHIDE

Plant and Main Office:
NIAGARA FALLS, NEW YORK

New York Office:
19 RECTOR ST., NEW YORK 6, N.Y.

...FOR VALVE APPLICATIONS INVOLVING EXTREME PURITY OR CORROSION RESISTANCE...

COMPARE

PERFORMANCE and PRICE

PERFORMANCE

Here is the famous Lapp solid-porcelain valve which has served spectacularly for many years in so many applications involving handling of corrosive chemicals—now reinforced for production security with a completely-enclosing shell of high-strength aluminum. Compare the table of prices for this equipment with that of lined valves, alloy valves, or any valves which will handle your difficult corrosion problems. On a straight dollar-and-cents basis, the Lapp *Armored* valve of *solid porcelain* is your best bargain in corrosion-resistant valves.

PRICE

LAPP ARMORED PORCELAIN "Y" VALVES

1"	$68	3"	$105
1½"	74	4"	137
2"	79	6"	263

LAPP ARMORED PORCELAIN ANGLE VALVES

1"	$68	2"	$79

LAPP ARMORED PORCELAIN FLUSH VALVES

1½" (for 3" tank outlet)	$168
2" (for 4" tank outlet)	205
3" (for 5" tank outlet)	242

WRITE *for complete information and specifications. Lapp Insulator Company, Inc. Process Equipment Division, 253 Maple St., LeRoy, N. Y.*

Lapp

PROCESS EQUIPMENT

CHEMICAL PORCELAIN VALVES • PIPE • RASCHIG RINGS

PULSAFEEDER CHEMICAL PROPORTIONING PUMPS

HOT OFF THE PRESS . . . NEWS OF IMPORTANCE TO BUSINESS EXECUTIVES

DAY AFTER DAY, new and profitable uses are found for CLARK fork-lift trucks and industrial towing tractors. Top flight operators, materials handling engineers and other plant officials, continue to develop applications for these machines that make them mobile "gold mines." Almost without exception, such new uses are as valuable to others as to their originators.

Many of these new ideas and applications are presented and illustrated in CLARK'S new MATERIAL HANDLING NEWS.

"Profitable reading" best describes this publication. If you already operate CLARK fork trucks, it may help you to employ them to even better advantage. If you are not yet a CLARK fork-truck user, you're certain to learn how they can be employed to your considerable profit.

FREE TO BUSINESS EXECUTIVES

For your copy of the new "how to handle it" issue of Material Handling News clip and mail this handy coupon . . . TODAY!

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS AND INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 8, MICH.

Please send the "how to handle it" issue of Material Handling News . . . without obligation.

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AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

INDUSTRIAL NOTES, cont. . .

1951, the key unit of the project will be a 60,000 kw. steam turbine. The purpose of the addition is to utilize byproduct gas for production of power.

Sterling Drug Inc.—Two research units at the plant of the Hilton-Davis Chemical Co. division, Cincinnati, Ohio. The units are designed for work on the development of new intermediates, dyes and pigments.

NEW LOCATIONS

Owens-Corning Fiberglas Corp. has moved its export division to New York. It will be headed by Keith O. Grove.

Brooks and Perkins Inc. has moved its headquarters staff to a newly constructed office building at 1950 West Fort St., Detroit.

Syntron Co., Homer City, Pa., has moved its New York sales and engineering office to 1860 Broadway.

Swartwout Co., Cleveland, has moved its ventilator division to its New York branch office at 103 Park Ave.

NEW REPRESENTATIVES

Hyster Co., Portland, Ore., has appointed the Northeast Industrial Equipment Co., Cambridge, Mass., to handle sales and service of its lift trucks and mobile cranes and their attachments in a territory comprising Maine, New Hampshire, Rhode Island, and part of Massachusetts.

Willson Products, Inc., Reading, Pa. has appointed the Charles A. Strelinger Co., Detroit, as its distributor in that area for industrial safety equipment.

General Electric Co., Pittsfield, Mass., has appointed the Central Scientific Co., Chicago, to distribute its silicone products for use in laboratories.

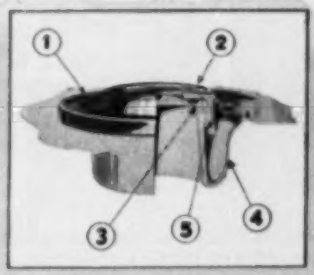
Hapman Conveyors, Inc., Detroit, has appointed Burnard C. York, Chicago, as its sales representative in Wisconsin, Minnesota and northern Illinois.

Alloy Steel Products Co., Linden, N. J., has appointed the following distributors: Republic Supply Co. of California with stocks carried at both Emeryville and Los Angeles; Railway and Power Engineering Corp., Ltd., Toronto, Canada. Wetzel Equipment Agency, Salt Lake

(Continued)

New Leakproof Pouring Spout-Closure

Delivers 100% Measure Every Time



CUTAWAY shows how "FlexSpout" protects contents. (1) Metal rim clamps polythene gasket directly to pail, (2) tamperproof metal seal, destroyed at first removal, (3) hermetic seal molded as part of spout provides added protection against leakage and tampering, (4) continuous polythene spout and diaphragm makes leakproof seal, and (5) polythene cap for re-use after seals are broken.

RETRACTABLE spout pulls out easily after hermetic seal is broken. Pouring is easier, every drop of pail contents is drained without ever touching exterior of spout. Polythene spout is translucent, shows when liquid is about to flow.

Made with chemical-resistant Du Pont polythene plastic, new tamperproof closure for pails eliminates evaporation and spillage, is easy to reseal

Here's a new, improved way to stop costly leakage, evaporation, spillage and tampering in pail shipments. It's the "FlexSpout"* closure—designed for easier pouring and more efficient sealing—made with tough, chemical-resistant Du Pont polythene. A typical success story:

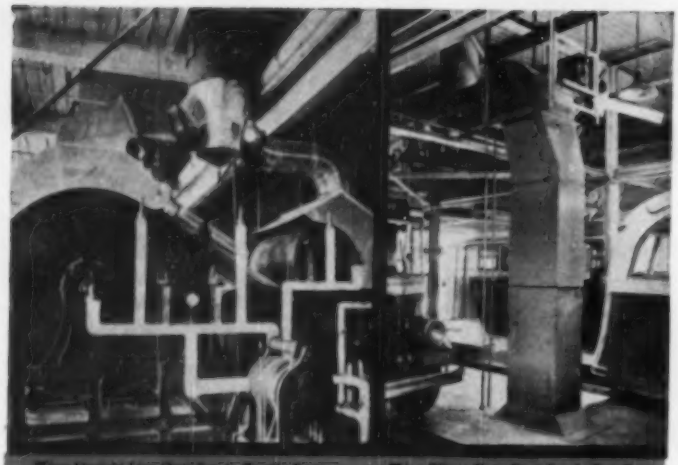
A large exporter of lubricating oils was experiencing leakages up to 14% in pail shipments. Test shipments were made with these new closures for several months to branches all ovvr the world. Not one single loss due to leakage was found!

Polythene's unusual combination of properties fitted "FlexSpout" to a "T". Its flexibility is made to order for the spout design—as is its extreme toughness—the seal withstands internal pressures far in excess of those the container will hold. Because of its outstanding chemical-resistance, polythene withstands any material that can be packaged in commercially lined pails—in fact, there is no known solvent for polythene at normal temperatures. Its very low rate of permeability to moisture and most gases protects aganist evaporation. And polythene is tasteless, odorless, non-toxic—can't harm ingredients. Further, the polythene cap provides a simple, effective reseal.

The outstanding chemical and mechanical properties of polythene may well be of service to you. Du Pont representatives will be glad to work with you, or to suggest suppliers of finished products of polythene and other Du Pont plastics. Write today for free literature on Du Pont plastics to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Plastics Sales Offices: 350 Fifth Avenue, New York 1, N. Y.; 7 S. Dearborn St., Chicago 3, Ill.; 845 E. 60th St., Los Angeles, Calif.

*"FlexSpout" closure manufactured by Rieke Metal Products Corporation, Auburn, Ind.

DU PONT
Plastics
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY



Wing Straight Line Axial Fan in Textile Factory — Wing Elbow Type Duct Fan in Bus Garage

WINGFOIL Axial Flow Fans HANDLE AIR—

—pure or impure—in any volume or pressure

Wingfoil Elbow-type Duct Fan

Wingfoil Straight-line Duct Fan

Wingfoil Safety Ventilating Fan

Characteristics of the Wingfoil Fan Make it ideal for almost any industry, but this is especially true in the process industry. For the Wingfoil Fan was *designed* to handle air containing dirt, heat, steam, explosive vapors, etc. The motor is unaffected by the impurities, corrosive qualities or explosive characteristics of the air being moved, as it is located entirely out of the air stream. It is especially applicable where there is appreciable resistance to the air flow, as the fan embodies the famous Wingfoil pressure type fanwheel—a remarkable non-overloading characteristic which prevents the motor from stalling or from burning out through overloading. As air resistance increases, the load on the motor actually decreases instead of building up or increasing. Light in weight, compact and easily handled, the fan is simply inserted into the duct line, either as an elbow or a straight section, fitting without any trouble and occupying little more space than the same length of duct. Complete data on air handling is contained in Publication F-10. Write for it.

L. J. Wing Mfg. Co.

170 Vreeland Mills Road, Linden, N. J.
Canadian Factory: Montreal

Wing

WINGFOIL FANS

INDUSTRIAL NOTES, cont. . .

City, Utah, has been appointed manufacturer's agent in Utah, southern Idaho, Wyoming and Colorado.

York Corp., York, Pa., has appointed four new distributors: Calcasieu Lumber Co., Austin, Tex.; Clayton C. Smith Co., Williamsport, Pa.; Hawes Electric Co., Huntington, W. Va.; Modernized Equipment Co., Cincinnati, Ohio.

Ampco Metal, Inc., Milwaukee, has appointed Southern Engine and Pump Co., Houston, Tex., to distribute its centrifugal pump line. The following stocking distributors have been appointed: Walter H. Eagen Co., Philadelphia; Kerr Machinery Co., Detroit; Pump Engineering Co., Los Angeles; Jackson Engineering Co., Indianapolis; Diehl Pump & Supply Co., Pittsburgh; Westco Pump Sales Co., San Francisco.

Hartford Machine Screw Co., Hartford, Conn., has appointed the following sales representatives for its tubular liquid level gage: Norman W. Fuller, New England; Gale Engineering, New York; Edwin Elliot & Co., Philadelphia; Rawdon Myers, Cincinnati; L. B. Penhallow, Los Angeles.

Ironton Fire Brick Co., Ironton, Ohio, has appointed Robbins and Bohr, Chattanooga, as its Tennessee representative.

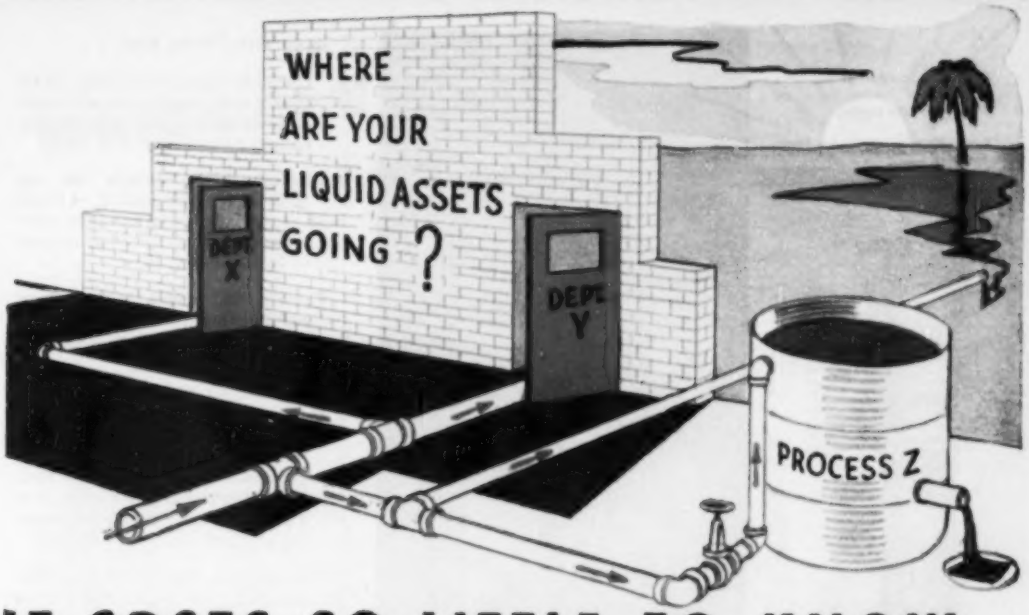
C. W. Nofsinger Co., Kansas City, Mo., has been formed to offer consulting, engineering and contracting services to the petroleum, chemical and general industries.

Erie Mfg. Co., Erie, Pa., has appointed the O'Brien Industrial Equipment Co., San Francisco, as its sales and engineering representatives.

Flexitallic Gasket Co., Camden, N. J., has appointed the following distributors: Moorlane Co., Tulsa, Okla., with branches in Kansas City, Amarillo, Denver, Oklahoma City and Wichita; Consultores Y Abastecedores Industriales, S. A., Mexico City. These agents have also been appointed: Boiler Equipment Service, Atlanta, Ga.; Lane Machinery Co., St. Louis, Mo.; Plant Equipment, Inc., Minneapolis.

Willsboro Mining Co., Willsboro, N. Y., has appointed Millmaster

(*Continued*)



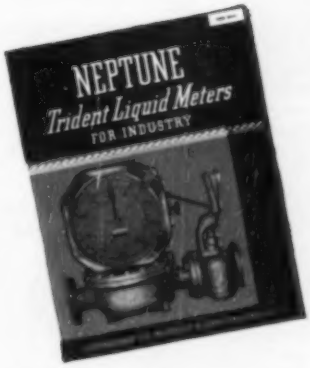
IT COSTS SO LITTLE TO KNOW

with NEPTUNE METERS

Liquids flowing through your plant show up in Profit & Loss—as raw materials or saleable products—as costs for heating or cooling—and in many other ways. Even the quality of your product depends on the control you have over these liquids.

It costs as little as a cent a day to keep close, accurate control with a Neptune liquid meter. No doubt about it—it pays to put a meter at each key point in your liquid lines. Measure liquids coming into your plant. Measure liquids delivered to each process, department or storage tank. Measure liquids shipped out of your plant. There's even a Neptune meter for putting just the right amount of liquid into a batch—automatically.

Already in service on 100 industrial liquids, Neptune meters are positive displacement type. They're quality built, simple in design for sustained accuracy. Ask experienced Neptune engineers for help in selection and installation. There's a Neptune office handy to you.



Ask for Bulletin 566-4—a gold mine of information on the accurate metering of industrial liquids.

NEPTUNE *liquid* METERS

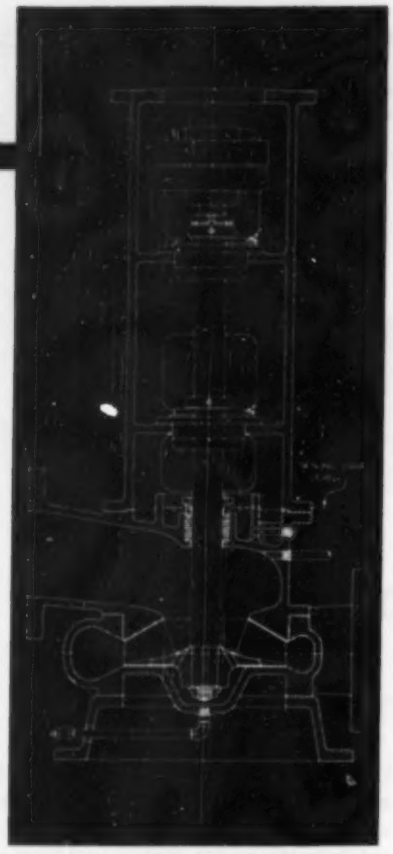
NEPTUNE METER COMPANY
50 WEST 50TH STREET, NEW YORK 20, N. Y.

Branches: Atlanta, Boston, Chicago, Dallas, Denver, Kansas City, Mo., Los Angeles, Louisville, Philadelphia, Portland, Ore., San Francisco, and Long Branch, Ontario

83-b

Right: Cross-section of Lawrence Vertical Top Suction Pump for pumping volatile liquids.

Below: Vertical Top Suction Pump.



Pump VOLATILE LIQUIDS

— Under a Low Net Positive Suction Head (NSPH)
— Under a High Vacuum
— Without Air or Vapor Binding

When handling volatile liquids under a very low Net Positive Suction Head—from evaporators, for example — a horizontal pump is apt to become vapor-bound. Air or vapor binding is impossible if you install the Lawrence Vertical Top Suction Pump illustrated above. Extremely high vacuums are maintained by filling the space around the packing box with water or some other sealing liquid. The costly delays and shutdowns resulting from vapor binding and loss of vacuum are completely eliminated.

Lawrence Vertical Top Suction Pumps can be furnished in special resistant metals and alloys to handle the most corrosive and abrasive acids and chemicals.

Send for Bulletin 203-4 for complete summary of acid and chemical pump data.

LAWRENCE PUMPS

LAWRENCE
MACHINE & PUMP CORPORATION
369 MARKET STREET, LAWRENCE, MASS.

INDUSTRIAL NOTES, cont. . .

Chemical Corp., New York, as exclusive agent for the sale of its calcium metasilicate and calcium magnesium metasilicate.

American Maize-Products has appointed the Thomas E. O'Neill Co., Chicago, as its exclusive representative for bulk products in most of Cook County, Ill.

Victoreen Instrument Co. has named the Terminal Radio Corp. its distributor in the New York area.

NEW LINES

American Machine and Metals, Inc. has established a new division through the acquisition of the Gotham Instrument Co., New York. This move results in the addition of a complete line of industrial recording and controlling instruments.

Westinghouse Electric Corp., Pittsburgh, Pa., has begun manufacture of a new insulating product at its plant at Irwin, Pa.

American Air Filter Co., Louisville, Ky., has merged with the Herman Nelson Corp., Moline, Ill. Each organization continues to operate from its respective headquarters, with present management and field representation, under the American Air Filter name.

NEW COMPANIES

Taylor Research Laboratories, Niagara Falls, N. Y., to do chemical consulting and experimental work in the fields of electrolytic processes, waste disposal, chlorination processes, salt equilibria, and bleaching compounds. Maurice C. Taylor heads the organization.

Pulva Corp., Perth Amboy, N. J., to market a line of impact type pulverizers.

Bradley and Levenson, New York, to do research and consulting work on synthetic resins, surface coatings and plastics. J. J. Bradley, Jr., and J. J. Levenson, Jr., are the organization's founders.

S-K-C Research Associates, Paterson, N. J., to provide research, technical consultation and development facilities in powder metallurgy, process and plant design, mechanical, chemical and metallurgical engineering. John D. Shaw, Walter V. Knopp and Catherine L. Clark have formed the organization.

—End

WHICH CAN YOU USE····
ONE-WAY···TWO-WAY OR THREE-WAY SEPARATION?

De Laval offers a ***complete line*** of centrifugal machines so that you may pick exactly the right one to speed up applications in ***your*** plant. They ***all*** speed up separation and clarification by making these steps continuous, but different types of separations require different De Laval machines. For example:

ONE-WAY SEPARATION

Usually called clarification. Removing a relatively small quantity of solid matter from a liquid, such as removing solids from glue liquor, or dirt from washed wool. For these applications a De Laval Multiple Clarifier is used.

TWO-WAY SEPARATION

Separating two liquids of different specific gravities, simultaneously removing small quantities of solids (usually less than 0.5%) and storing them in the bowl. Typical applications: penicillin—water phase from solvent; blood from plasma; dehydration of many kinds of oils. Machine used: De Laval Industrial Separator.

THREE-WAY SEPARATION

Continuous separation of two liquids and simultaneous removal of solids from the liquid mixture. Typical applications: separating fish oil from grease; clean oil from fruit juice and pulp. Machine used: De Laval "Paraflo-Matic" Separator.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

De Laval

CONTINUOUS CENTRIFUGAL SEPARATORS & CLARIFIERS

FOR FASTER PROCESSING SYSTEMS

SPECIALISTS IN *Southwest* CONSTRUCTION

If you are planning an industrial project in the Southwest, your organization may well profit from Brown & Root's thirty years' experience in Southwestern building.

Meeting the unique challenges offered by soil, climate, and terrain of this area, requires specialized techniques . . . know-how acquired only through years of Southwestern development.

Why not let Brown & Root's experience work for **your** organization's benefit?

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Quotes, Extracts and Digests

MORGAN M. HOOVER, Assistant Editor

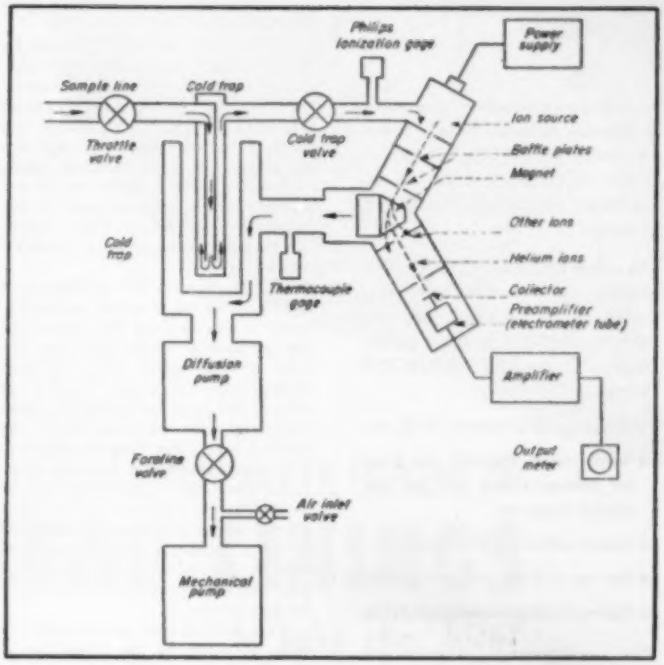


Diagram of mass spectrometer leak detector.

Mass Spectrometers for Leak Detection

Z. G. Deutsch and Frank Raible

The portable mass spectrometer, pictured diagrammatically above, was developed to detect leaks of an infinitesimal nature, such as those encountered in the gaseous diffusion plant at Oak Ridge for the concentration of uranium isotopes.

If the inleaking air contains only normal amounts of H_2O, there would be an immediate side reaction to make uranyl fluoride, and H_2F_2. Uranyl fluoride and UF_6 are both in the solid phase under conditions where UF_6 is in the gaseous phase, and the possibility of plugging the pores in a diffusion barrier, plus aggravating an already serious corrosion problem by the presence of H_2F_2, required that the diffusion plant have a degree of tightness heretofore unheard of.

Since the diffusion process gives a small enrichment per stage, and since the ratio of molecular weights of the isotopes is very small, and at the same time is large between UF_6 and almost any other gas, inleakage of ambient air into the process streams introduces considerable operating difficulties.

In the early work of blocking out the process design of this plant, the unique characteristics of the process dictated the setting up of specifications for permissible inleakage as a maximum of one one-hundredth of a standard cu. ft. per hr. per thousand cu. ft. of process equipment volume. This is equivalent to a pressure build-up, at high vacuum, of 8 microns (1⅛ ten thousandths of a psi.) per hr. This means that an evacuated small fraction of the process equipment, say one 10,000th of it, if it had only one leak of maximum tolerable size, would take four months to build up pressure barely visible to the unaided eye looking at a mercury column. Imagine how hard it would be to find such a leak, if it were divided into 20 leaks, each about 1/20th as big!

Most of the industrial experience with equipment approaching such tightness, has been with mercury arc rectifiers. This experience had evolved methods of cleaning metals, certain welding and gasketing procedures, followed by pumping to a high vacuum with reasonably high capacity equipment and observing pressure rises. Fairly large and obvious leaks generally meant replacement of certain parts of such equipment, followed by a second try at maintaining vacuum. In laboratories, on the other hand, maintenance of high vacuum generally meant laborious and tedious searches for points of inleakage and coating with vacuum tight waxes. If these methods were to be applied to the full-scale diffusion plant, it would require at least as many man-hours to achieve tightness as required in manufacturing, fabricating, and assembling the plant itself. Obviously, something much better had to be done under the pressures of war. Through the application of the leak detecting techniques which were developed during the war, and which resulted in the presently available specialized mass spectrometer for the purpose, it was possible to make a substantial improvement on the process specifications. A pressure build-up of only 2 microns per hr. in the assembled plant was achieved at an effort measuring approximately 1 percent of the total effort required to manufacture and assemble the process plant.

The first portable mass spectrometers made expressly for the purpose of detecting leaks, were constructed at the University of Minnesota, under the direction of Professor Alfred Nier in 1942. The probe gas used was helium. Helium is the ideal tracer for several reasons:

1. It is rare, existing only in very small concentrations in the atmosphere.

2. It is inert, so that it does not contaminate the system, and further, it is readily removed from the system by pumping.

3. It has low molecular weight.

(Continued)

$60. per day more material recovered per machine

the MIKRO brand of ECONOMY

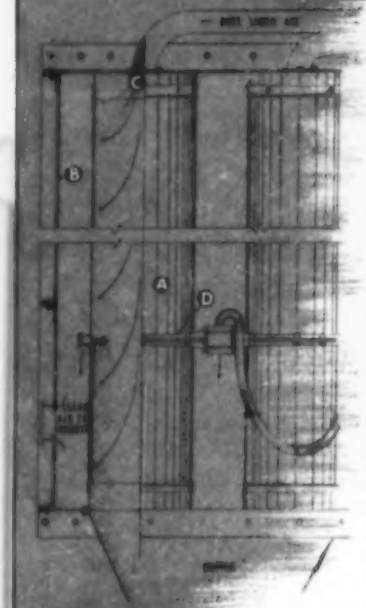


Diagram showing operation of the MIKRO-COLLECTOR. Felt bag (A) is clamped in housing (B). Dust-laden air enters from top (C). As the air passes thru filter medium, dust deposited on inner surface of bag is dislodged by operation of cleaning ring (D). Cleaning is accomplished by counter-current of pressured air from ring and flexing of bag by ring as it moves up and down continuously.

One large manufacturer processing a valuable material, recently found that each MIKRO-COLLECTOR* installed in his plant saved him an additional $60 per day in salvaged material.

These and similar dust-saving, profit-making performances are being rolled up on all sides. They are directly attributed to these advantages which the MIKRO-COLLECTOR brings—

★ High percentage of recovery—99.9% plus.

★ Greatly reduced filter cloth area means low maintenance costs, quick and easy material changeovers.

★ Constant uniform flow of dust-laden air.

★ Filter rate 15-25 cfm. per sq. ft. of fabric.

★ Cleaning ring eliminates mechanical shaking.

The revolutionary principles employed in MIKRO-COLLECTOR design insure optimum recovery and sensational filter rates. Our research laboratory and test facilities are available for your dust collection problem without charge or obligation.

SEND FOR—your copy of new MIKRO-COLLECTOR bulletin

*Patents applied for by H. J. Hersey, Jr. and Pulverizing Machinery Company.

PULVERIZING MACHINERY COMPANY
Chatham Road Summit, New Jersey

MIKRO-COLLECTOR
Reg. U. S. Pat. Off.

By the makers of
MIKRO-PULVERIZERS and MIKRO-ATOMIZERS

PRESERVE OUR HERITAGE: FAITH, FREEDOM AND INCENTIVE

QED, cont. . .

This property allows considerable simplification of the design of the spectrometer.

The development of a single purpose, portable mass spectrometer for leak detection was made possible by the fact that helium was the only gas to be detected, and extremely precise measurements of concentration were not necessary.

Let us first focus our attention on the mass spectrometer tube in the diagram. The mass spectrometer tube is the Y-shaped part on the right-hand side of the diagram. This tube is the heart of the instrument; it separates the helium from all incoming gases, and causes it to generate an electric current that is proportional to the helium concentration. This current can then be measured on an electrical meter.

The gas flow in the instrument is shown by the small arrows in the diagram. It can be seen that gases from the equipment under test enter the tube at the upper end, and pass through the ion source. In the ion source, the gases are ionized by bombardment with electrons which are emitted from a hot tungsten filament. The resulting positive ions are accelerated down the length of the tube by electric fields, produced by the difference in potential between various electrodes in the ion source. These potentials are derived from the power supply, which also provides the filament heating power.

The positive ions move down the tube, as shown by the dotted line in the figure. After passing through the slits in the upper baffles, the positive ions move between the pole pieces of a permanent magnet mounted within the tube itself.

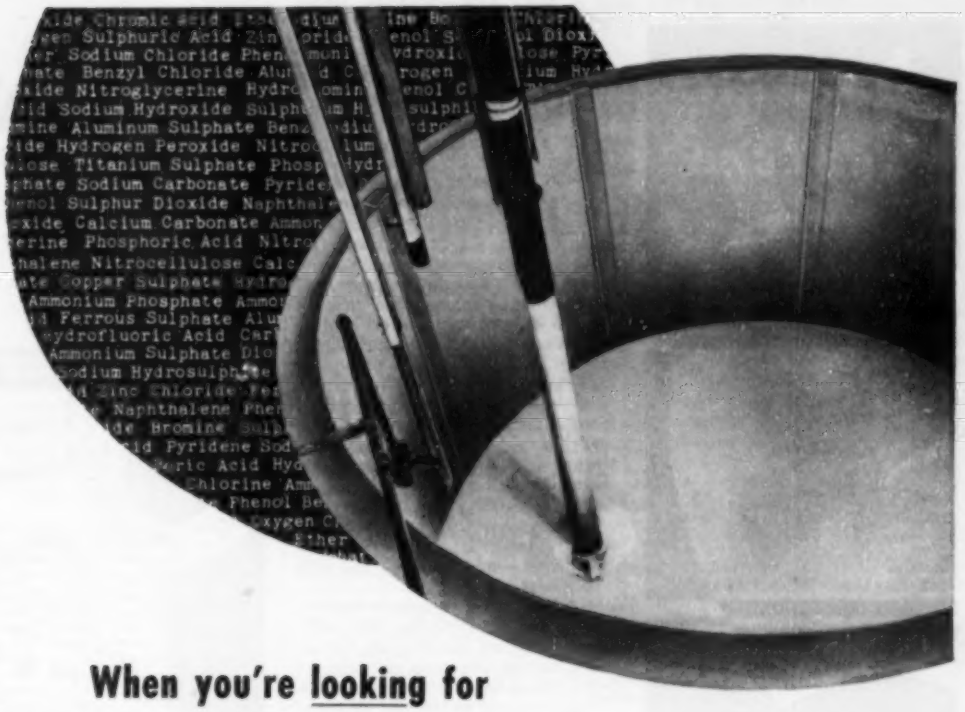
The direction of the magnetic field is perpendicular to the plane of the paper. This field deflects the ions so that their path is circular within the magnetic field, the radius of curvature depending upon the mass of the ion. Lighter ions such as hydrogen are de-

(Continued)

ESSENTIAL FOR NATIONAL SECURITY

"The events of the past few months indicate more clearly than ever before the vital necessity of keeping our nation vigorous and strong. We can be strong only so long as we can produce. We cannot produce if the means are withheld from us, and when we can no longer produce, we as a nation will lie prostrate before the world."

Crawford H. Greenwalt, president
E. I. du Pont de Nemours & Co.



When you're looking for

LEAD LININGS

to take the "bite" out of corrosive chemicals

If your processing operations involve the handling of corrosive chemicals... you'll want tank linings of lead. Why? Because lead is the *able* metal. It not only is *able* to resist corrosion, but is also adapt*able*, work*able*, dur*able*, and salvag*eable* after many, many years of service.

National Lead sheet with this unique combination of abilities is available in these grades: *chemical*, "standard" for most uses; *tellurium*, for increased corrosion resistance and strength at high temperatures; *antimonial*, for strength, stiffness and hardness; *tellurium-antimonial*, for extra hardness where erosion or cutting is a problem; *Nalco Metal*, a new lead alloy developed to give longer, better service in handling chromic acid solutions.

Basic metal for all these grades is "St. Joe chemical lead,"—produced from Southeast Missouri ores. This lead is universally recognized as best for handling chemicals.

When you need lead linings, buy National Lead sheet. For, as the leader in lead, National gives you the benefit of metal resources, mechanical equipment, and production know-how second to none. Plants in all principal cities.

...look to the Leader in Lead

...for everything from lead pipe...valves...sheet ...and lead-lined or lead-covered equipment...to a complete acid recovery plant

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QED, con't. . .

flected more than heavier ions, such as carbon dioxide.

The electric field in the ion source is so adjusted that only helium ions (mass 4) are deflected by the right amount to enable them to pass through the slits in the lower baffles. All other ions, after passing through the magnetic field, are stopped by the baffles. Thus the helium ions have been separated from the others, and continue in a straight line until they strike the collector. This flow of helium ions constitutes a minute electrical current, which is detected by the special electrometer tube, or pre-amplifier, mounted within the spectrometer tube. The external amplifier then further amplifies the current to the point where it deflects the output meter. In the absence of probe gas helium, the ion current impinging upon the collector is essentially zero. Any current detected by the collector must be due to the presence of helium in the gas sample entering the mass spectrometer.

The rest of the equipment depicted in the diagram comprises the pumping system, and the sampling system, both serving the mass spectrometer tube. The tube must be maintained at a high vacuum; to this end it is continuously pumped by the diffusion pump and the mechanical pump. The cold trap aids in the reduction of the pressure by freezing out condensible vapors. It is in the form of a hollow vacuum bottle, which can be filled with liquid air or dry ice.

The vacuum gages serve to measure the pressure in the system. The ultimate vacuum in the instrument is less than 0.01 micron; the maximum operating pressure is about 0.5 micron at the Philips ionization gauge.

Gas from the equipment under test flows through the sample line, then enters through the throttle valve, which is used to control the amount of incoming sample gas, so as not to exceed the maximum operating pressure. The cold trap in the sample line is immersed in the same refrigerant as the main cold trap. Thus, condensible

(Continued)

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Sam L. Brous, Marketing Manager
Chemical Department
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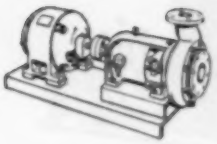


❶ I-R Chemical Pumps are Built for Easy Maintenance — and less of it

❷ They are ARMORED AGAINST CORROSION — with *IRCAMET*

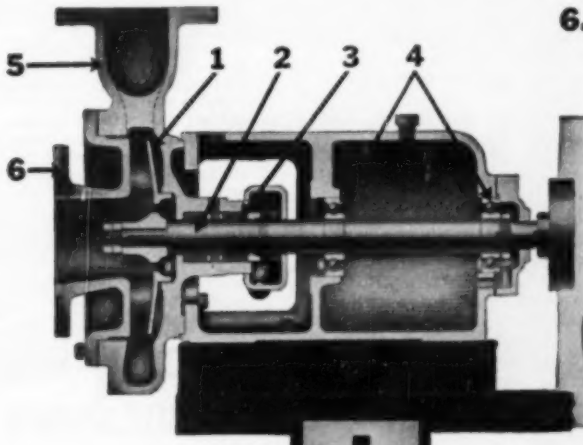
Ingersoll-Rand chemical pumps are built to stand up under the continuous handling of corrosive and abrasive liquids. All parts of the pump that come in contact with the liquid are made of IRCAMET — a high nickel-chromium-molybdenum alloy steel developed exclusively by I-R for chemical pump service. Laboratory tests and years of field experience have proved its exceptional ability to resist the corrosive action of a wide variety of acids and alkalis. Other materials are available for special operating conditions.

❸ They are PROTECTED AGAINST LEAKAGE —with the *LEAKOLLECTOR*

The patented LEAKOLLECTOR stuffing-box gland — an exclusive feature of all I-R chemical pumps — provides a simple and effective solution to the problem of pump leakage. It completely encircles the stuffing box, trapping all leakage so that it can be drained away for collection or disposal. The split gland is accurately fitted to both the inside and outside of the box, and will catch any seepage escaping between the shaft and packing, or between the packing and the bore of the box. The LEAKOLLECTOR is easily removed from the shaft for repacking the box.

These pumps are ruggedly constructed to last longer on the job — and the simple design, with all parts easily accessible, means less "time out" for maintenance. Here are just a few of the many I-R features that add up to maximum performance, minimum maintenance, and high operating efficiency. For complete details, contact your nearest I-R engineer.

1. The impeller is of simple, one-piece construction, provided with balancing ports so that the stuffing box is under suction pressure.
2. The short, rigid, stainless-steel shaft prevents impeller whip and eliminates many stuffing-box problems.
3. The deep stuffing box holds 5 to 7 packing rings and a seal cage, and can be packed solid or arranged for internal or external seal. The packing is always especially selected for the liquid to be handled.
4. Two heavy-duty ball bearings provide rigid support for the rotor. The bearings are oil-lubricated and the oil is automatically maintained at the proper level.
5. The discharge nozzle is an integral part of the casing, and its vertical position makes the pump self-venting.
6. The suction nozzle is removable, permitting easy access to the impeller without disturbing the discharge piping.



The CAMERON SHAFT SEAL can be installed on all I-R chemical pumps to replace the conventional stuffing-box packing. It eliminates stuffing-box leakage and requires practically no attention or maintenance.

I-R Chemical Pumps are of the centrifugal type, of simple cradle-mounted design, coupled to the driving motor. They are available in sizes to handle up to 4000 gpm at temperatures to 800° F.

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vapors are prevented from reaching the spectrometer tube.

When a helium jet strikes a leak, the inleaking helium is rapidly pumped through the large volume of the equipment under test; thence through a diffusion pump, and soon reaches the leak detector. Once the helium reaches the spectrometer, the signal is almost instantaneous, showing that a leak has been probed.

Z. G. Deutsch, consulting engineer, and Frank Raible, Vacuum Electronic Engineering Co., before the New York Section, American Institute of Chemical Engineers, Mar. 7, 1950.

SOIL STABILIZATION
. . . and Chemicals

John B. Wilbur

An ocean beach, a soupy mud road, or a muddy pasture can be turned into a stable, rubbery surface suitable for landing operations, movement of heavy vehicles and landing of aircraft in less than 5 hr.

The treatment is based on an entirely new approach to soil solidification. It can be used even on soils which contain as much as 30 percent water by weight—enough water to make clay as soft as bread dough. The result, after a few hours, is a soil material of rubber-like consistency well adapted to withstand heavy impact loads and to distribute static loads over an uneven foundation.

The actual stabilization process is based on calcium acrylate, which is absorbed by the soil particles. Then come two other compounds, sodium thiosulphate and ammonium persulphate, which cause the calcium acrylate molecules to lock themselves together.

The binding action begins 2 min. or less after the mixing has taken place, and 5 hr. after treatment the soil is an elastic mass with tensile strengths from 5 to 10 psi.

If the stabilized soil is allowed to dry in air for a week or more, tensile strengths of 500 psi. or even more are obtained—but this gain in strength is accompanied by a loss in elasticity. The soil becomes much harder.

Rewetting of the dried soil causes a return of the material to its original rubber-like consistency and its tensile strength returns to that achieved 5 hr. after the treatment had originally been carried out.

In the recent M.I.T. tests of the process, a stabilized soil block 3 in. thick withstood the weight of a car moving over it 24 hr. after treatment without noticeable indentation. A 16-lb. steel ball dropped onto the test

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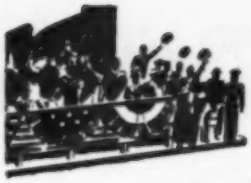

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section from a height of 7 ft. rebounded about 6 in. without causing any damage to the section.

A similar blow on any of the known pavements such as concrete would probably have resulted in serious shattering.

The present cost of the chemicals is still high, but there is reasonable hope that if the chemicals were manufactured in mass production their cost would be substantially reduced.

John B. Wilbur, M. I. T., reporting on the soil stabilization study sponsored by the Engineer Research and Development Laboratories, Feb. 11, 1950.

BUSINESS
. . . and Unfair Taxes

Joseph F. Leopold

The growing racket of doing business without paying taxes, combined with the present desperate hunt for new sources of revenue to pay the mounting expenses of government, is at last bringing home to Congressmen the realization that something has got to be done and very soon. Every indication points to the probability that a remedy for the present unfair situation may be made a part of the 1950 revenue bill, which will be passed at the second session of the 81st Congress.

There are instances of taxpaying firms being gobbled up by tax-dodging cooperatives, or absorbed by tax-exempt schools, or swallowed whole by so-called charitable trusts. To keep alive, some firms have reorganized their businesses on a tax-free basis and others have pulled up stakes and moved to tax-free Puerto Rico.

Legal loopholes in old tax laws and liberal interpretations in Treasury regulations are blamed for evasions which are costing the government more than a billion dollars yearly of much needed revenue, which is more than enough to provide a substantial reduction in the wartime nuisance taxes, save the country from the danger of the renewed deficit financing, or even permit lessening of the burden of high individual taxes.

Bill HR 5064 proposes to impose income tax on the business earnings of all the tax exempts. The amendment on bill HR 3095, on which action is pending in the Senate, calls for taxing the retained earnings of cooperatives and permitting continued exemption only to those that do business 100 percent with members and pay out all earnings in cash each year.

Tax exempts include so-called chari-

(Continued)

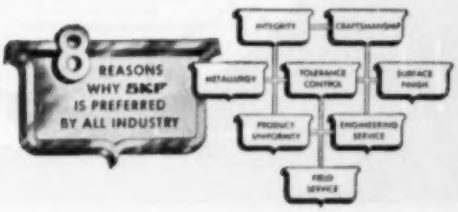
solidifying slurry in a hurry

...aided by SKF

Bird Continuous Centrifugal Filters speed up the separation of solids from liquids . . . do a better job at lower operating costs. On light-duty models, main bearings are two SKF Single Row Deep Groove Ball Bearings . . . thrust bearings are two SKF Angular Contact Ball Bearings. On heavy-duty models, main bearings are two SKF Spherical Roller Bearings and two large SKF Angular Contact Ball Bearings for the thrust locations. That's typical of the way SKF always puts the right bearing in the right place. Pioneers of the Deep Groove Ball Bearing, Spherical Roller Bearing and Self-Aligning Ball Bearing, SKF . . . through constant research and development . . . anticipates the demands of industry for bearings that work economically and efficiently. *SKF Industries, Inc., Philadelphia 32, Pa., the Pioneers of the Deep Groove Ball Bearing – Spherical Roller Bearing – Self-Aligning Ball Bearing.* 7090

SKF

BALL AND ROLLER BEARINGS



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Many enthusiastic users of Schneible Multi-Wash Systems in the Chemical Industry are our best recommendation.

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Model JC—from 1000 to 30,000 cfm capacity or in multiple units. Model HC—with capacities from 1500 to 30,000 cfm or multiple units for larger capacities. The above standard models are also available in special design with double-contact impingement stages and special non-corrosive materials for oil cooking and other chemical applications.

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QED, cont. . .

table trusts and foundations, city owned street-car lines, gas and electric companies and other utilities, labor unions and educational institutions. The government itself is operating money-making businesses with interest-free taxpayers' funds and competing with private companies. The TVA is an outstanding example of government tax-free competition. Congress will not long permit the tax dodging facilities offered by Puerto Rico which has already attracted 40 firms from the mainland. The biggest and most important of the tax-dodging competitors of general business are the cooperatives, which were originally exempted for the purpose of helping the farmer for the purpose of marketing his produce. These cooperatives are now using their income tax freedom as a stepping stone for expansion into a multitude of other businesses.

Joseph F. Leopold, tax specialist, before the Drug, Chemical, and Allied Trades Section of the New York Board of Trade, Jan. 24, 1950.

RADIOISOTOPES
. . . *Expanding Commodity*

Charles E. Crompton

Nine thousand shipments of radioactive materials have now been made by the Atomic Energy Commission to scientists in all parts of the country, opening up a new era of research progress in the United States.

So widespread is the demand for these new research tools that more than 100 separate laboratories are now engaged in synthesizing radioactively labeled compounds for the use of investigators, many of whom are not sufficiently skilled in organic synthesis to make their own.

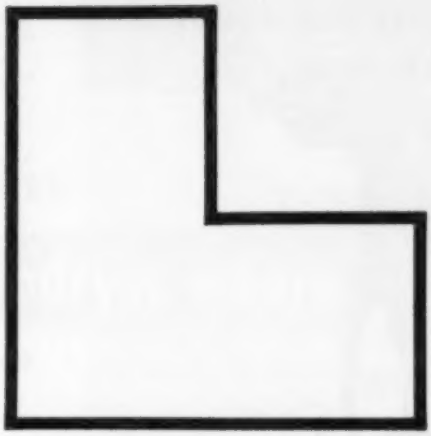
As recently as January 1948, only one such labeled compound—methyl alcohol—was available commercially, and even last January only about two dozen useful compounds of this type could be purchased. Today, however, more than 130 labeled compounds are on the market, and the number is growing constantly.

Although many of these compounds were first synthesized at AEC laboratories and made available through the Oak Ridge National Laboratory, it has always been the policy to encourage private enterprise to enter this field. When a private concern offers a labeled compound for sale, the commission will cease distributing the same compound from commission laboratories.

The Isotopes Division has contracted with six different laboratories

(Continued)

PROCTOR HAS THE ANSWER



Divide up this plot of ground into sixteen smaller plots, each of equal size and all of the same shape as the diagram shown at the left. Par for this puzzle is five minutes. LOOK FOR THE SOLUTION WHICH WILL APPEAR NEXT MONTH.

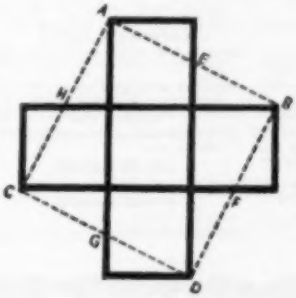
TO THIS PUZZLE

and your drying problem

Of course, providing the answer to this puzzle will be much simpler than providing the answer to your drying problem. All we have to do to answer the puzzle is turn to the "answer" page in the book from which this puzzle was taken. There's much more to solving drying problems. But puzzles or drying problems—reaching the solution must follow a similar pattern. You must begin with a clear understanding of the problem and then with an open mind, think logically along the possible lines of approach that are open to you.

That is exactly the way Proctor engineers go about solving your drying problem. With your help, they obtain a clear grasp of your requirements and then through their research techniques they explore the possible avenues of approach to the solution. There is no short cut to an intelligent solution—but the time and effort can be reduced when Proctor engineers are consulted early . . . as soon as you realize that drying is to be a part of your processing. Not only does early consideration speed the solution—it may save you hundreds of dollars that otherwise may be spent for preliminary or subsequent equipment not properly dovetailed to the drying system required to meet your needs.

When you have a drying problem—consult Proctor engineers early—avail yourself of their services and laboratories—*at no cost or obligation.* You'll find it pays. Call or write today.



The problem was—transform large square into five small squares, all equal to one another, whose total area shall be equal to the original large square.

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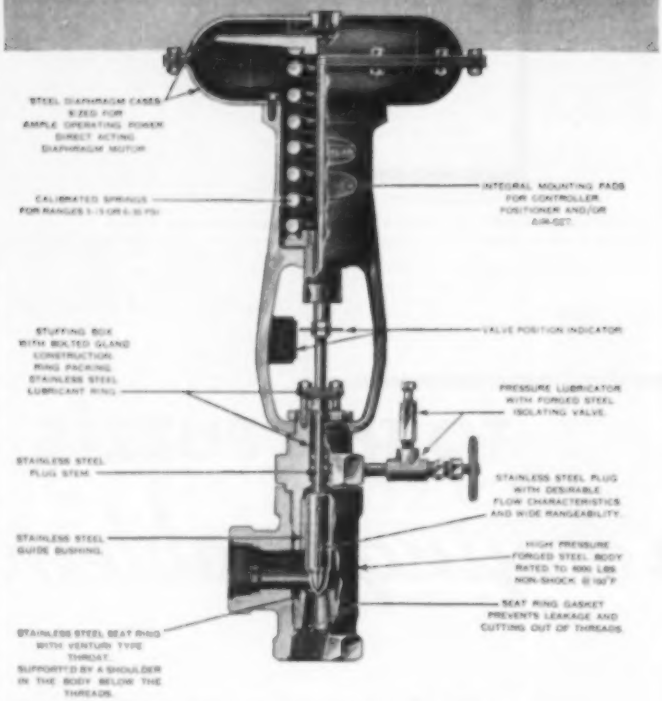
MASONEILAN HIGH PRESSURE
CONTROL VALVES
Meet Severe Operating Conditions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STAINLESS STEEL SEAT RING WITH VENTURI TYPE THROAT, SUPPORTED BY A SHOULDER IN THE BODY BELOW THE THREADS

These tough, rugged control valves are especially designed for high pressure reducing or back pressure service. Built to exacting standards of quality materials, they assure dependable performance under the most severe operating conditions. They can be used in steam, water, oil, gas or chemical service.

These control valves may be operated by any suitable controller. Mounting pads are provided on spring barrel for instrument, positioner and/or air set. Investigate these Masoneilan high pressure Control Valves.

No. 137-S Control Valve

SPECIFICATIONS

BODY

Material — Angle Types — forged steel; Globe Types — cast steel.
Ratings — Angle Types: 6000 psi at 100°F., 2500 psi at 750°F.; 3000 psi at 100°F., 1500 psi at 750°F. Globe Types: 3000 psi at 100°F., 1000 psi at 750°F.
Sizes — 1", 1½" and 2"; Screwed connections.

TRIM

Material — Stainless steel plug, seat ring, plug stem, guide bushing and lubricant ring.
Also available: 300 Brinell hardness AISI Type 440-C steel plug and seat ring; or stellite faced plug and seat ring.
Orifice Sizes — For 1" Valves — ¼", ⅜", ½", ¾", 1".
For 1½" and 2" Valves — ¼", ⅜", ½", ¾", 1".

DIAPHRAGM MOTOR

Action — Direct action (air-to-close) is standard. Reverse action (air-to-open) available.
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¼" pressure lubricator with forged steel isolating valve.

AIR-FIN BONNET

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3–15 psi standard.
6–30 psi available.

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for the development of practical methods of synthesizing 45 selected labeled compounds. The purpose of this program is to make these compounds available at a price based only on the time and materials required to carry out the final synthesis.

Another important development in the application of tagged atoms to various research problems is the increasing number of scientists who are seeking and receiving training in the handling and use of radioisotopes. Last year alone the Oak Ridge Institute for Nuclear Studies trained about 400 scientists in the use of this versatile new research tool.

Charles E. Crompton, Oak Ridge National Laboratory, before the New York Section, American Chemical Society, Jan. 31, 1950.

CORROSION
. . . *New Rust Preventives*

William D. Robertson

Corrosion of steel and iron by circulating water can be almost completely prevented by addition of small amounts of tungsten and molybdenum compounds. Potassium and sodium compounds of tungsten and molybdenum can make substantial cuts in the annual billion-dollar losses caused by rust.

The compounds, sodium tungstate, potassium tungstate, potassium molybdenate, and sodium molybdenate, are expected to be especially useful in the air-conditioning and cold-storage industries. Both of these industries make extensive use of steel pipes to circulate water or brine.

Dissolving a few hundred parts of the tungsten and molybdenum compounds in a million parts of the circulating water or brine will stop rusting. Water circulating through a steel pipe can corrode 4 lb. per yr. per sq. yard of exposed metal. Brine is even more corrosive.

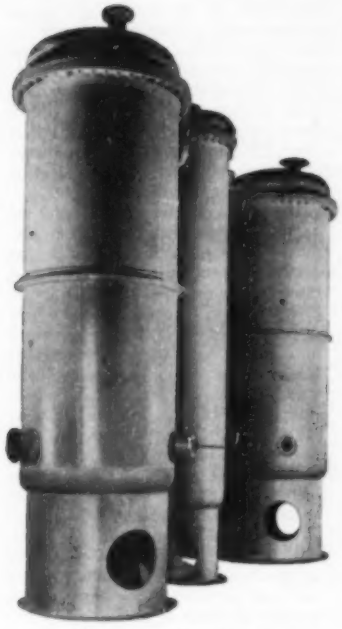
These new anti-corrosion chemicals were discovered in the course of an investigation into why potassium and sodium chromates keep water from rusting steel. These substances have been used as rust inhibitors for 40 yr., but no one is yet sure how they work.

In looking for an answer to this problem, the molybdenum and tungsten compounds were tested. They were found to be just as effective in curbing corrosion as the chromates and in lesser amounts.

The new compounds are currently more expensive than the chromates but have one major advantage over them. The chromates are a vivid yellow.

(*Continued*)

When you design DRYing into a process show Lectrodryer where



Large Lectrodryers are field-erected.

The type of Lectrodryer you need has probably already seen service somewhere else—time-tested and proved. No need for you to have the bother, expense and hazards of developing a new drier. Lectrodryers are as standard as motors.

Call in a Lectrodryer engineer when you first recognize the need for DRYing. He knows the pitfalls to avoid, its limitations and possibilities, short-cuts to take. He's had a world of experience solving problems in DRYing air, gases and organic liquids.

Plant designers, builders and owners find that Lectrodryer service saves them time and money. We can give you a quick estimate on Lectrodryers of any type or size, enabling you to make other engineering decisions without delay. Write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

REGISTERED TRADEMARK U. S. PAT. OFF.

To achieve and maintain proper humidification for your process, use TAG's Saturation Controller. This instrument is dependable, gives accurate temperature-humidity records, provides positive relative humidity control required by many industrial processes.

Moreover, the TAG Saturation Controller is fully automatic. It continuously maintains the wet bulb depression for which it is set, regardless of changes in the dry bulb temperature. The instrument requires little attention beyond regular, periodic chart changes.

See for yourself how simple the TAG Saturation Controller is to install...how effectively it operates... how easily it can solve your saturation problem. Just ask your TAG Representative for the informative new technical booklet shown above . . . or write.

TAG

WESTON ELECTRICAL INSTRUMENT CORPORATION

Manufacturers of Tagliabue and Weston Instruments

614 Frelinghuysen Avenue, Newark 5, New Jersey

QED, cont. . .

which make them unsuitable for use in processes where such color would be undesirable. The tungsten and molybdenum compounds are colorless, which extends the possibilities for use of corrosion inhibitors, including anticorrosive paints. It is also expected they will be as effective as the chromates in protecting aluminum and magnesium against corrosion.

William D. Robertson, University of Chicago, before the Institute for the Study of Metals, Chicago, Feb. 17, 1950.

RESEARCH
. . . *Present Outlook*

M. J. Kelly

Science and technology are playing an increasingly important part in the economic and social life of our country. Beginning some four or five decades ago we, in this country, have been transferred at an increasingly rapid tempo from a primarily agricultural society to a predominately industrial one under the driving force of an expanding body of science and technology. Indeed science and technology have come so much into their own that when the man in the street now speaks of progress he usually means scientific and technologic progress.

It is through pure research that we obtain our knowledge of the fundamental laws of nature to which the matter and energy of our world and universe conform and of the structure of matter and energy in all its forms. Applied research, basing its programs on the new knowledge made available from pure research and employing the scientific method, which has had an inseparable part in the evolution of scientific knowledge, provides the reservoir of knowledge that is the driving force of the creative technology of our industrial society. An adequate volume of pure and applied research is as essential to an expanding industrial society as is the fuel oil to the diesel engine that pulls our modern trains or gasoline to the engines of a modern airplane or automobile.

If the volume or quality of the research in either the pure or applied areas is inadequate, the progress of our society towards higher standards of living with decreasing hours of productive effort will slow down. The greater the inadequacy, the greater the effect. It is conceivable that so great an inadequacy could develop that economic and social problems of sufficient magnitude be created and enemies from without become so bold that we lose our society of free men.

In general the volume of both pure

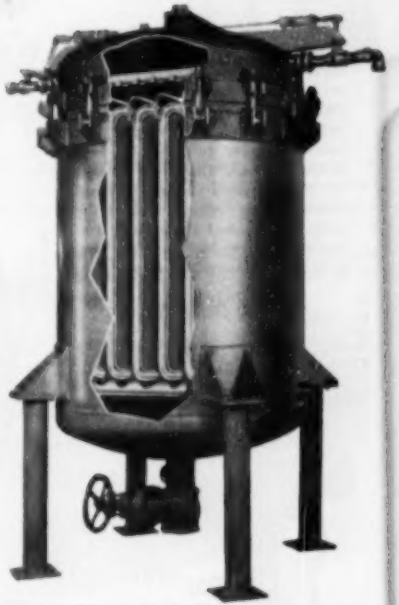
(*Continued*)

A Sparkling Clear Filtrate . . .
FASTER . . . AT LOWER COST
With Niagara Stainless Steel Filters

Niagara Stainless Steel Filters give you complete, sparkling filtrate clarity at rates two to five times as high as conventional cloth-covered filter presses —and at lower overall cost. That is why more process engineers are choosing Niagaras than ever before.

The totally enclosed, leakproof Niagara Filter requires NO CLOTHS to handle, wash or replace. There is almost no wear on the all-stainless-steel filter leaves, which provide up to 500 square feet of filter area in one compact unit. Maintenance is virtually eliminated, since there are no moving parts.

Niagara Filtration engineers would like to help you get the answers on any process involving clarifying filters. Their experience can be helpful to you in getting improved quality, increased production and lower maintenance and labor costs. Just write, describing the problem, and you will receive a prompt reply. Be sure also to ask for Bulletin G-447.



The new Niagara "Auto-Sluice" is self-cleaning. It permits fast automatic cake removal and disposal, increases productive filter time, and enables one man to handle as many as six filters at one time.

PILOT FILTER RENTAL

Should you prefer to conduct filter tests in your own plant, a Niagara pilot filter will enable you to predict results accurately. For full details on pilot filter rental service, check the coupon below.

Niagara Filter
CORPORATION
3087 MAIN ST., BUFFALO 14, N. Y.

NIAGARA FILTER CORP., 3087 Main St., Buffalo 14, N. Y.

Please send: ☐ General Bulletin G-447; ☐ information on the Niagara "Auto-Sluice"; ☐ details on Pilot Filter Rental.

NAME _____
TITLE _____
COMPANY _____
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The TIME for DECISION is *NOW!*

"Too late to dig well when house is on fire" . . . this old Chinese proverb never had more meaning than now. Decentralization for National Security has passed the planning stage. Clear-thinking industrial executives know that the time has come to decide on WHERE TO DIG.

Here in the clean, slum-free spaciousness of Iowa, where it's just minutes from work to play, pioneers in industrial decentralization have PROVED that national safety . . . better living . . . and more profitable operations can go hand in hand. Skilled, steady, unworried workers . . . modern plant locations . . . adequate electric power . . . fine transportation . . . and sympathetic government all combine to make Iowa your land of Industrial Opportunity.

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FACTS . . . FIGURES . . . the vital statistics on Iowa's population, existing industries, agriculture, raw materials, markets, transportation, power . . . living conditions are all organized for your use in this valuable reference book. Every industrial executive should have it. Send for your free copy today. Address 733 Central National Building, Des Moines 9, Iowa

IOWA DEVELOPMENT COMMISSION

QED, *cont. . .*

and applied research is so great and its quality of such a high order that we have every reason to expect a continuation of the trend, at perhaps an even higher tempo, toward higher standards of living for all accompanied by decreasing hours of work.

Within the time available we shall analyze the elements of the problem that justify such an optimistic conclusion. We shall restrict our examination to those areas of pure research that are directly essential to industrial progress—they include the physical sciences, physics, chemistry and mathematics—and to the areas of applied research that are essential to the creative technology of our industries.

M. J. Kelly, Bell Telephone Laboratories, before the Northern California Research Conference, Jan. 11, 1950.

RESEARCH
. . . *Function of the Colleges*

Fred C. Lindvall

The development of basic science has been an outstanding contribution of the world's academic institutions. Research and inquiry for its own sake, without specific objective or application has been an intimate part of the work of colleges and universities and has built substantially all of the foundation upon which our modern technology and applied research in industry is based. Such free research is a logical part of the teaching and the advancement of knowledge which are the functions of a college. In fact, basic research is not only a proper function of the colleges, it is an obligation. Laboratories of industrial research and the government laboratories have not and will not assume the responsibility for basic scientific research. The colleges and the few private foundations must continue to seek this new knowledge with even greater effort to support the expanding technology.

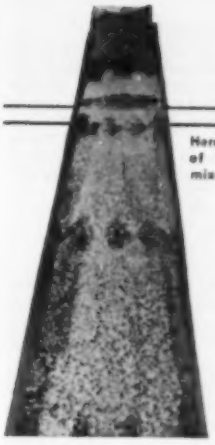
Particularly in the United States is the need for this scientific effort great because the present sorry state of European science eliminates the pos-

(Continued)

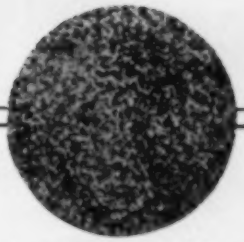
SOMETHING ELSE NEEDED

"To speak of a mass return to the caveman era through the erection of unlimited underground plants is to speak of an inattainable and impractical goal. Nor should we expect mass migrations of entire industries from one section of the country to other sections for the sake of security through dispersal."

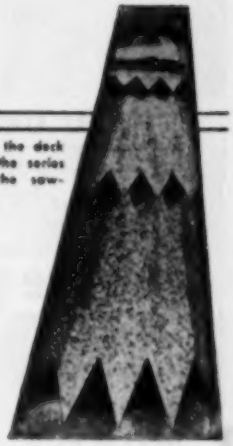
Guy B. Panero
Guy B. Panero Engineers.



Here you can see the action of two materials being mixed as they are conveyed



This magnified view shows a mixture after being conveyed only 8 feet.



Here you can see the deck construction and the series of steps. Note the saw-tooth edges.

Interested in

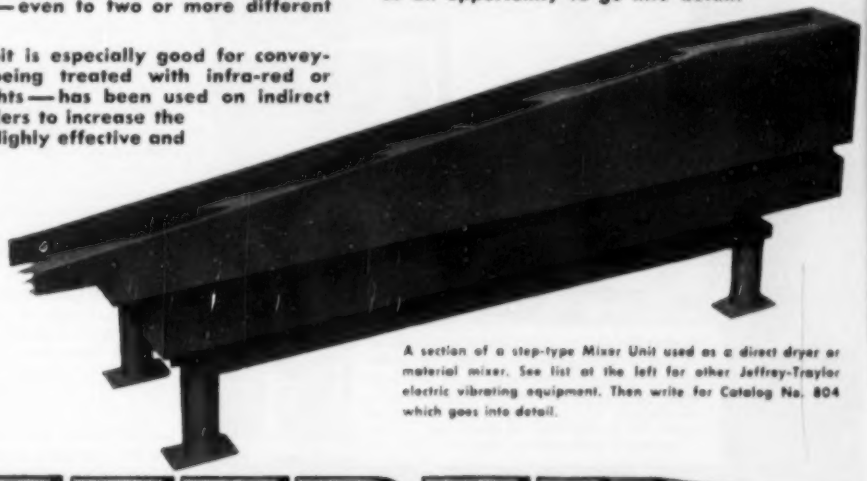
MIXING · DRYING · COOLING?

Then you'll want to know more about this Jeffrey-Traylor patented Mixer or step type of Conveyor. Look at the photos — note the series of steps with saw-tooth edges. The material passes over these steps, the side slip discharge causing an intermingling of particles — turnover being partially or completely effected. Material is thoroughly mixed — even to two or more different materials.

This type of unit is especially good for conveying material being treated with infra-red or ultra violet lights — has been used on indirect dryers and coolers to increase the heat transfer. Highly effective and essential in roasting or toasting processes — possible to produce uniformly toasted material (throughout the bulk) when other methods have failed.

We will be very happy to tell you more about this process and what it can do for you. Give us an opportunity to go into detail.

Feeders
Dryers
Coolers
Conveyors
Screens
Barrel Packers
Packing Tables
Bin Valves
Bin-Level Controls
Waytrols



A section of a step-type Mixer Unit used as a direct dryer or material mixer. See list at the left for other Jeffrey-Traylor electric vibrating equipment. Then write for Catalog No. 804 which goes into detail.

THE JEFFREY MANUFACTURING COMPANY

Established 1877

909 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

Baltimore 2	Chicago 1	Detroit 13	Jacksonville 2	Pittsburgh 22
Birmingham 3	Cincinnati 2	Huron	Milwaukee 2	St. Louis 1
Boston 16	Cleveland 13	Houston 5	New York 7	Salt Lake City 1
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For Jeffrey-Traylor Equipment in Great Britain Lockers (Engineers) Inc., Warrington, England.

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you are paying 30 times
MORE THAN YOU SHOULD
PENFIELD — world's largest exclusive manufacturer of ion-exchange water demineralizers — offers 20 different models, engineered to deliver water of any quality and volume you specify. Prices range from $75 for 10 gal/hr cartridge model used by pilot plants, small factories and laboratories, up to the multi-bed systems with capacities of one, five and ten thousand gal/hr.
put your water problems up to
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pioneers in ion-exchange
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Penfield Manufacturing Company, 30 High School Avenue, Meriden, Conn.

TIMELY WARNING

"Neither a 3,000-yr. coal supply nor wishful thinking about dwindling petroleum reserves guarantees the triumph of the American coal industry over its oil and natural gas competitors.

Reed Moyer
Assistant to the Vice-President
Central Indiana Coal Co.

QED, cont. . .

sibility of our continuing to import the major portion of our basic scientific knowledge. By tradition and by demonstrated performance, the academic institutions are best suited to make the advances in basic science. In this effort the colleges need the support of industry and the closest of collaboration with the industrial research laboratories whose effectiveness is in the useful applications of scientific knowledge.

Fred C. Lindvall, California Institute of Technology, before the Northern California Research Conference, Jan. 11, 1950.

REFRIGERATION

. . . *Versatile Azeotrope*

W. A. Pennington and W. H. Reed

In the designing of a refrigeration system, it is customary as the first step to select a refrigerant and then design the equipment to fit the refrigerant. However, in this work the main objective was not to fit a machine to a refrigerant but rather to fit a refrigerant to an existing machine.

At the outset of this investigation, there were apparent at least three distinct needs for refrigerants:

(1) A refrigerant which can be charged into a hermetic system, designed for Freon-12 (F-12) and 60-cycle current, so that the same refrigeration capacity will be available where 50-cycle current is used,

(2) A refrigerant which can produce an evaporating temperature at least 10 to 15 deg. F. lower than that resulting in the use of F-12 in the same machine with the same condensing temperature, and

(3) A refrigerant with 15 to 25 percent increase in refrigeration capacity over that of F-12 at the same operating temperatures so that some motors which do not now have complementary compressors can be used with existing compressors to get units with specific capacities not now available.

Since no suitable single compound could be found through a rather exhaustive study of the literature, investigations have been made to discover

(Continued)

A versatile valve for general service . . .

LUNKENHEIMER Figure 123 N-M-D Non-Metallic Disc

150 lb. S.P.
300 lb.W.O.G.

The valve with the quick-change disc

STEAM • HOT WATER • COLD WATER
AIR AND GAS • GASOLINE • OIL • BUTANE • PROPANE

Ultra-modern Manufacturing Facilities

From raw material control to final testing, new machinery, methods and research improve the quality and speed the making of Lunkenheimer Valves. New production equipment, like the group of medium ram type turret lathes shown here, is but a small part of Lunkenheimer's extensive improvement program to provide users with the best possible valve service.

Fig. 123 is an exceptionally rugged valve . . . available with various types of discs especially compounded to give top results on the services for which they are recommended. Discs can be renewed or interchanged quick as a wink, insuring long-time satisfactory valve service with negligible maintenance expense. Disc holder is slip-on type, perfectly guided. Hexagon head gland is an aid to easy repacking. A further economy feature is the distinctive, long-wearing stem material developed by Lunkenheimer, eliminating stem-thread failure due to wear.

The "N-M-D" valve is also regularly available in angle, check and quick operating patterns. Circular No. 558, descriptive of the complete line, is yours for the asking.

N. M. D. and other Lunkenheimer Valves are available in all industrial centers. You can depend upon your Lunkenheimer Distributor for prompt service on your requirements.

ESTABLISHED 1862

THE LUNKENHEIMER CO.

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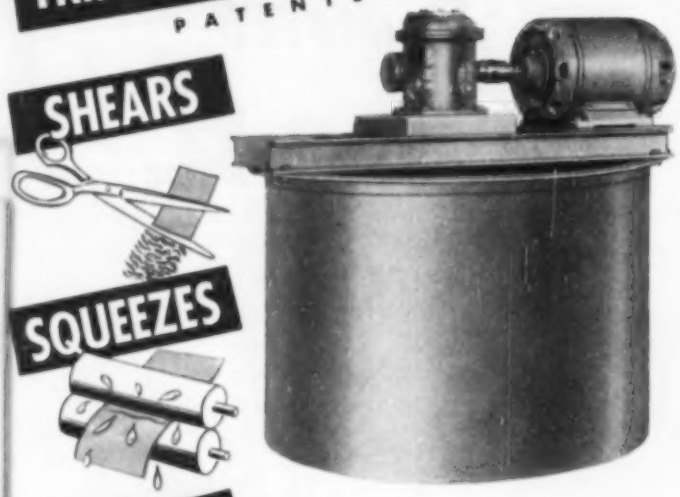
NETTCO

TRIPLE ACTION RE-PULPER

PATENTED



This new Nettco Agitator combines cutting, shredding and squeezing in a simple rugged unit—only one major revolving part.

It has the unsurpassed mixing action of the Nettco turbine *plus* the effects of the additional elements to disintegrate and mix all components.

Among the varied uses of the Nettco Re-Pulper are the extraction of algin from sea kelp, the repulping of paper stock, the mixing of wall paper colors, the blending of printing ink, etc. On these jobs it replaces equipment that is higher in first cost and more costly to maintain.

The Re-Pulper is only one of the specialized mixing devices designed and manufactured by Nettco Agitating Engineers for over 40 years.

SEEING IS BELIEVING

You saw it in action at the Chem Show efficiently handling paper pulp of 4 to 6% consistency. Try it on YOUR difficult mixing jobs — it will save you time and money. Write for information.

NEW ENGLAND TANK & TOWER COMPANY

87 TILESTON STREET, EVERETT 49, MASS.

QED, cont. . .

an azeotropic mixture that would fill the desired role. Such a mixture containing 25.8 percent symetrical difluoroethane (Genetron-100) and 74.2 percent dichlorodifluoromethane (Freon-12) has been found which achieves 95 percent of the desired increase in refrigeration capacity. This composition is azeotropic at 32 deg. F. It is known as Refrigaloy-1.

Not only does this refrigerant solve the 50-cycle problem but it has other applications. One of the most important being that of a substitute for Freon-12 in systems which are lacking in capacity.

It will produce a lower temperature in the evaporator than F-12 where the compressor speed is the same. It will make it possible to do the same number of refrigeration jobs with fewer machines and hence will contribute to the general economy of the industry.

Chemical stability tests have been conducted in rough manner by heating G-100 and R-1 in steel cylinders so as to have a reflux action continuously and periodically. Water, and sometimes air, was used along with a fairly large group of metals, including aluminum. The maximum temperature was around 150 deg. F. There was no change in the amount of non-condensibles nor was there any evidence of corrosion.

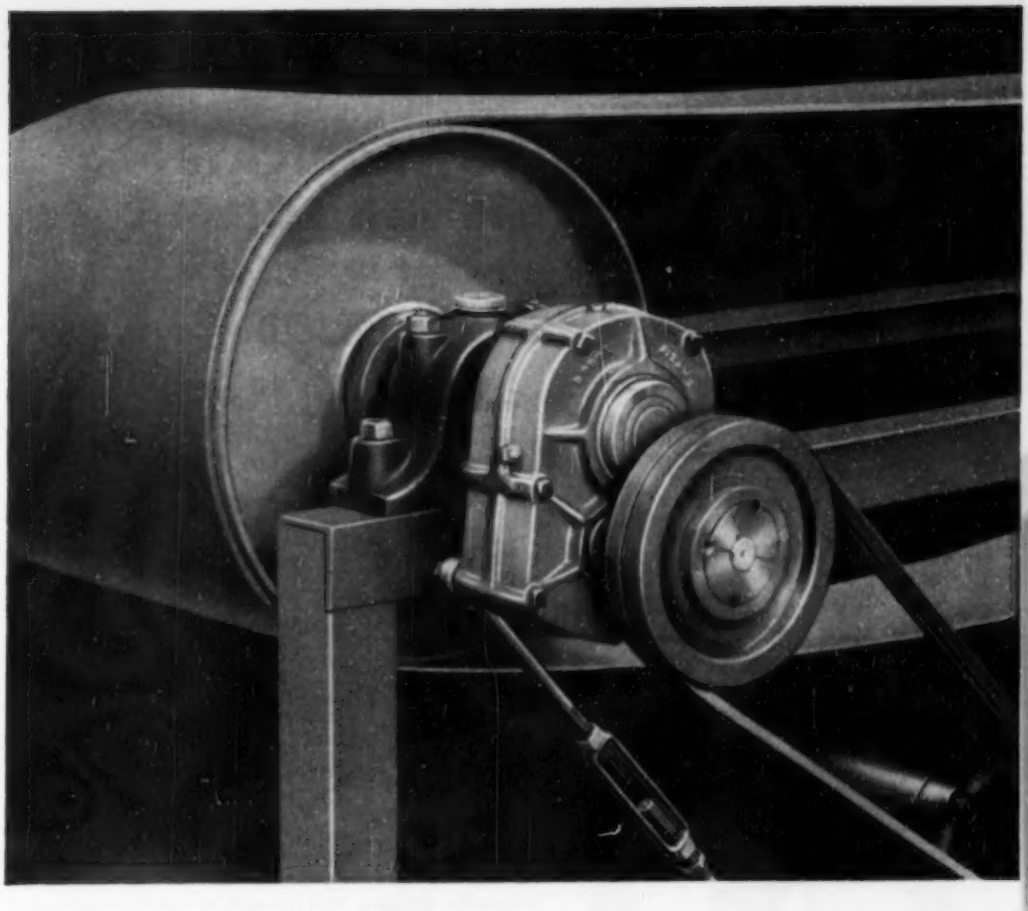
In addition to the corrosion tests already mentioned, a group of metals including copper, brasses, steel and aluminum were put in the vapor and liquid space on the high temperature side of a 3-hp. air conditioning system. The unit was run so that the superheated refrigerant vapor was close to 200 deg. F. There was no indication of any appreciable corrosion of the test coupons nor was there any trouble with the compressor.

Genetron-100 itself is flammable, but all attempts to burn Refrigaloy-1, where the percentage of G-100 was held as low as 27 percent failed even when the refrigerant was preheated to some 300 deg. F. No tests were made involving a higher percentage of G-100.

No tests have been conducted in this laboratory on toxicity. However, Knapp has stated that the toxicity of G-100 is to be regarded as being in the same class as F-11 and F-12. There can be a little doubt then that R-1 will meet the needs and requirements from this standpoint.

W. A. Pennington, Carrier Corp., and W. H. Reed, Syracuse University, before the American Institute of Chemical Engineers, Houston, Tex., Mar. 1, 1950.

—*End*



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TORQUE-ARM SPEED REDUCER!

TRADEMARK

NEW COMPACTNESS!

NEW DOUBLE LOCK ON SHAFT!

NEW RUGGEDNESS!

NEW SAVINGS!

HEAR what actual users say: "It saved us 32% over a floor-mounted installation!"—"That new sealed-in back stop sold me!"—"The turnbuckle is a mighty handy belt tightener!"—"Never saw so much performance in such a little package!"—"Smooth and quiet—and it's got guts!"

If you haven't yet seen this great new speed reducer, you've missed something. Available from *stock*, with stock-product economy and convenience. Six sizes with capacities up to 25 H. P. Any output speed from 13 to 133 R.P.M. No special engineering—accurate selection is simple.

WRITE us for special bulletin No. A470 including complete description, specifications and easy-to-use selection table.

DODGE MANUFACTURING CORPORATION, 200 Union St., Mishawaka, Indiana

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained, he can give you valuable assistance on new, cost saving methods. Look for his name under "Power Transmission Equipment" in your classified telephone book.

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FIRST IN POWER TRANSMISSION MACHINERY

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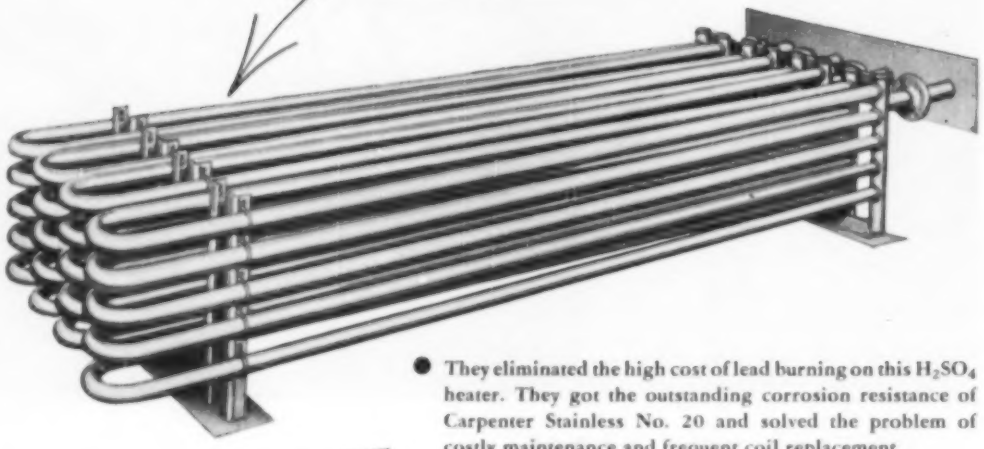
✓ COSTS LESS TO FABRICATE
✓ STAYS ON THE JOB LONGER

Now that it is made from

Carpenter Stainless No. 20



● They eliminated the high cost of lead burning on this H_2SO_4 heater. They got the outstanding corrosion resistance of Carpenter Stainless No. 20 and solved the problem of costly maintenance and frequent coil replacement.

Where highly corrosive acids and their fumes work against you, Carpenter Stainless No. 20 can work for you—at a saving. Samples for testing will be sent on request.

Test Coupons of No. 20
will be sent for your use if you will tell us the type of equipment involved, the corrosion problem encountered (with average and maximum temperatures), etc. Please give as much process information as possible.

New Bulletin Describes No. 20 and its Uses

Corrosion resistance data, fabricating information and application data are included in the new Carpenter Stainless No. 20 Bulletin. A note on your company letterhead will bring your copy to you.

THE CARPENTER STEEL COMPANY
Alloy Tube Division • 103 Springfield Road, Union, N. J.

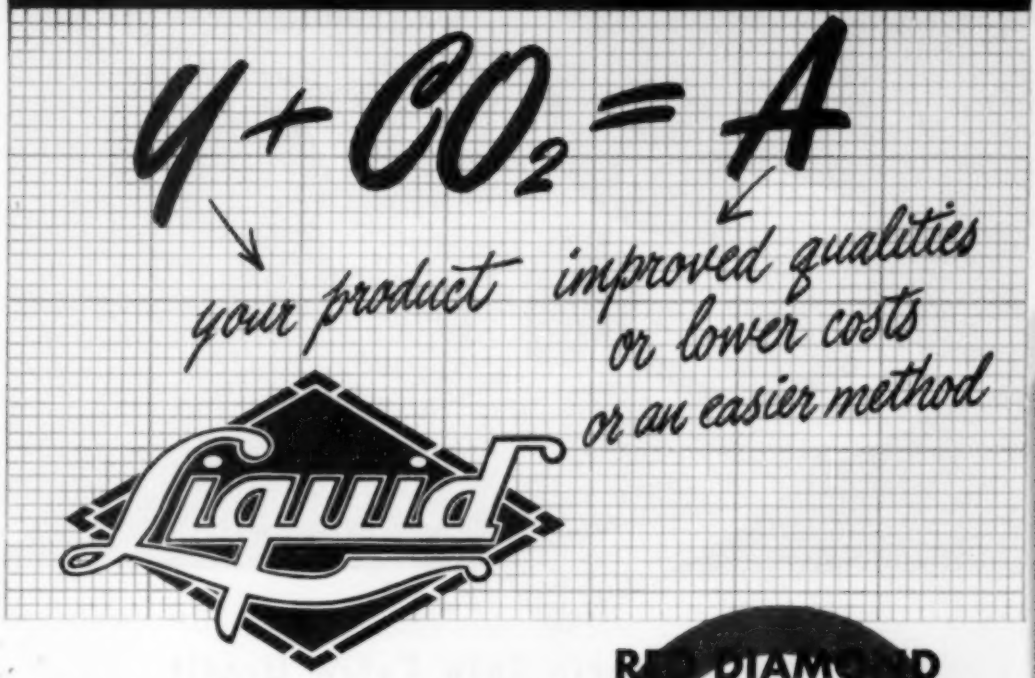
Export Department: 233 Broadway, New York 7, N. Y. "CARSTEELCO"

Carpenter

STAINLESS NO. 20

Licensed under patents of The Duriron Co., Inc.

Red Diamond Carbon Dioxide may be your answer to many production, testing or control problems!



Industry uses "LIQUID" Carbon Dioxide in many and amazing ways — to simplify shop processes, to assure higher testing accuracy, to control production hazards — and for a large variety of other purposes. For every known use, there are many other possible applications — limited only by the product, its characteristics and the problems involved. We invite a discussion of the potentials of CO_2 in your plant. CO_2 has the capacity to serve you profitably in ways undreamed of today that can be developed through experience and research.

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CO_2
IN ALL ITS FORMS
GAS • LIQUID • SOLID

Write for a free copy of "A CHART OF INDUSTRIAL USES" which suggests new and proved ways to use valuable CO_2 — its applications in industry are broad.

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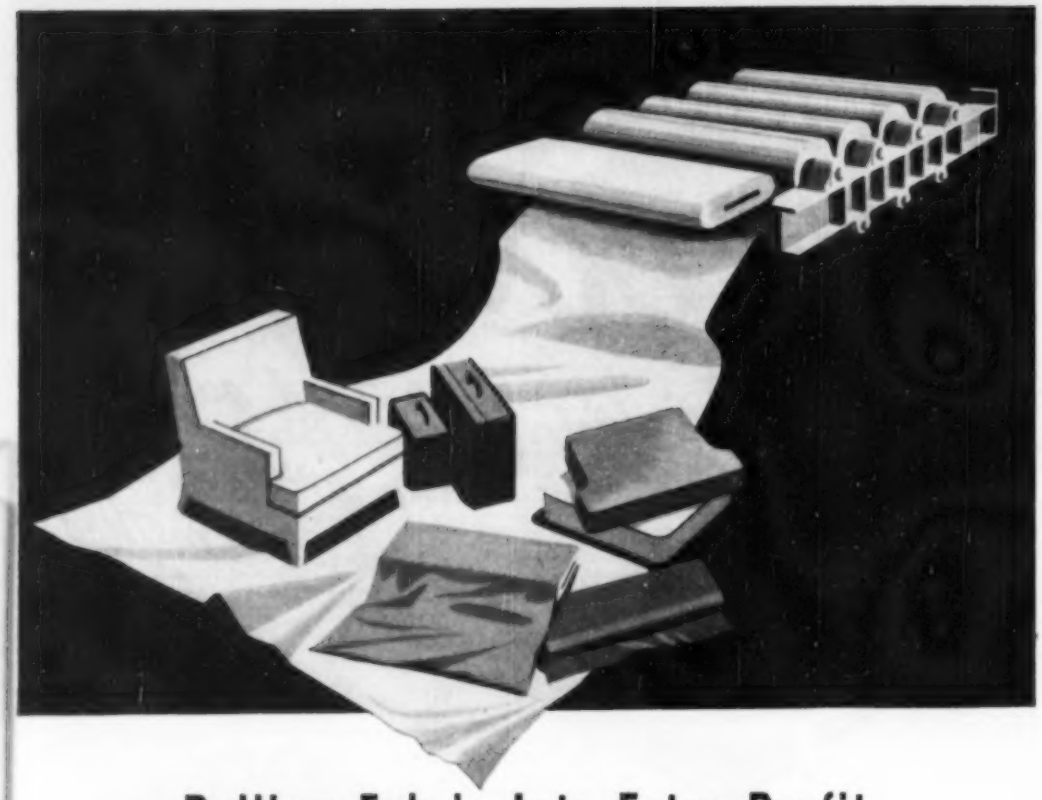


Rolling Fabric Into Extra Profit

Take an attractive but inexpensive fabric or paper. Laminate to it a thin vinyl film. Then watch it sell like hot cakes . . . and at a premium. Essentially, that's the story behind one of America's fastest growing new product developments . . . one with wide potentialities still to be explored. Before commercial success could be achieved, machinery had to be devised for low-cost lamination and to provide fast switchover from one paper or fabric to another. Lukenweld developed 2 units, with driven jacketed stainless steel heating and cooling rolls mounted in an inexpensive welded plate frame. Today, similar machines are in wide use throughout the industry.

Maximum product dependability with minimum cost are the result of years of experience of Lukenweld engineers working with steel plate. Higher predictability, improved appearance, resistance to shock, reduced weight, increased strength and rigidity, more flexibility of machine design, reduced production costs and elimination of patterns usually result from the use of Lukenweld construction. Here at your disposal are Lukenweld's knowledge of machine design, construction, installation . . . plus Lukens 140 years' experience in developing and producing specialty steels.

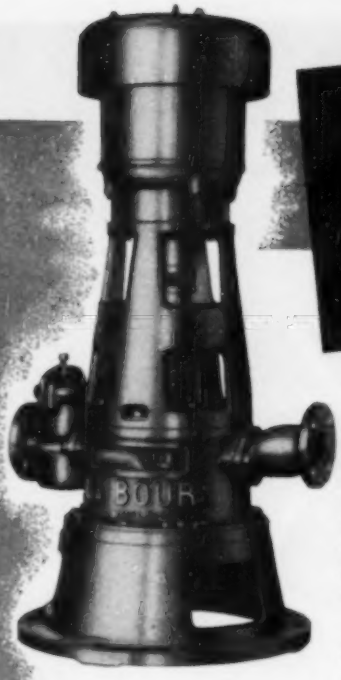
If you are considering new cylinder drying machinery, processing machines or other finished units, write Lukenweld, Division of Lukens Steel Company, 400 Lukens Building, Coatesville, Pennsylvania.

Improved machinery for improved processes through engineering

LUKENWELD

LUKENS

A DIVISION OF LUKENS STEEL COMPANY



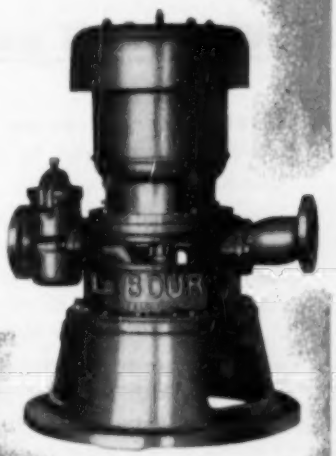
MAINTENANCE-FREE
Pumping Service Gets a NEW MEANING

For more than 27 years, LaBour pumps have been noted for dependability of service with minimum maintenance requirements. With the introduction of Type G LaBour pumps, packing difficulties were eliminated because there is no packing, no rubbing seal of any kind—standing or running—in a Type G. It was a revolutionary development in the field of self-priming centrifugal pumps.

Now, the modified Type G, designated as Type BG (and as BGM when motor is direct-mounted), goes still further toward eliminating the necessity for visits by the maintenance man. Lubrication has been improved, there are better safeguards against fumes, construction has been simplified, volatiles and toxics can be handled.

If you haven't seen a LaBour Type BG and considered how it can save you money in moving corrosive or dangerous liquids, it will pay you to investigate without delay.

THE LaBOUR COMPANY, Inc.
Elkhart, Indiana, U. S. A.



LaBOUR Type BG

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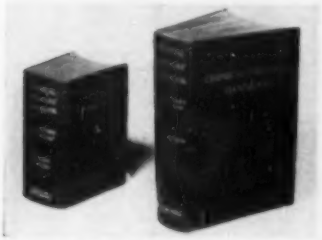

BIGGER & BETTER
Perry's new edition has 1,942 pages each 7.25 x 9.875 in. The second edition had 3,029 pages each 4.75 x 6.875 in. That means an increase of 279 sq. ft. (40,100 sq. in.) for new additional information.

CHEMICAL ENGINEER'S HANDBOOK. Third edition. Edited by John H. Perry. McGraw-Hill Book Co., New York. 1,942 pages. $15.

For a year or more most chemical engineers have known that a revision of Perry's Handbook was in the works. The new third edition finally was published last month. So you can get yours any time.

Revision has meant three increases: size, price and value. The inconvenience of size and price will be offset by the greater value.

Size of the page is now 7¼ x 9⅞ in., increased from 4¾ x 6¾. The old page size, if it had been kept, would have meant a third edition that was too fat to be comfortable. The new page size, too, allowed a double-column format—with greater reading ease. It also permitted larger graphs—with resulting increase in clarity and accuracy of reading.

Price is not as bad as it seems at first wallop. Compared with an average-size, 500-page textbook selling at better than 1c. per page, Perry's is less than 0.8c. per page. (And the publisher's investment is about six times that necessary for the textbook.) For students there is a special textbook edition at $12.50 (less than 0.65c. per page).

Value has grown by addition of new sections, rewriting and expansion of others, and thorough revision of most of the remainder.

The first few sections remain essentially the same. Changes have been in the line of rearrangement and modernizing. Examples: Log tables are 5-place instead of 6-place; thermodynamic properties are in the data section rather than the principles section; qualitative analysis and organic chemistry have been dropped; Mollier diagram of CO_2 dropped, CO added. The Fluid Flow section has new material on compressible flow and pressure drop across tube banks and packed solids.

General Theory of Diffusional Operations—Section 8—is new. It serves up introductory theory for the following three sections: distillation, gas absorption and solvent extraction. These three also contain new sub-sections on azeotropic, multi-component, extractive and molecular distillation, and dialysis.

In the Humidification section a new psychrometric chart is an improvement and there are several new pages on cooling towers and spray ponds.

Drying—Section 13—has been rewritten entirely. So was Size Reduction (16) with its new sub-section on size enlargement. So were High Pressure Technique, Movement and Storage of Material, Power Generation, and Plant Location. So was Process Control—which has turned out to be one of the best sections in the book.

Revised sections include Adsorption, Mechanical Separations, Mixing, Fuels, Refrigeration, Electricity, Electrochemistry and Accounting.

Materials of Construction (21) was revised too. Its 100 pages hold real worthwhile information. Better than 75 percent are taken up with *Chemical Engineering*'s table of chemical resistance of constructional material. This table is a valuable guide in tackling corrosion problems.

WIDELY USED
Perry's Handbook goes everywhere that the chemical engineer goes. This one went to war—with its owner through the Pacific campaigns of the 2nd Marine Division. Its enemies were water and mold.

EDITOR PERRY
In addition to editing his Handbook and holding down a full time job with Du Pont, Jack Perry is an active member of both American Chemical Society and American Institute of Chemical Engineers.

It would be easy to point out inconsistencies in spelling, typographical errors and other faults. But no good purpose would be served. Editor Perry was working with more than 140 authors, experts and advisors. It's a wonder there are not more mistakes and serious errors.

The fact that there are not is a tribute to "one of the hardest-working chemical engineers in the country." (Quoted appraisal by a contemporary.) He read and carefully edited all copy and all proof for this job—and also held down his full-time job with Du Pont. It must be his Down East (born in Maine 1895) background and his Massachusetts Institute of Technology (Ph. D. 1923) ability that have combined into a hard-working capable engineer. His capacity for work amazes those who know him.

Not only is he a member of ACS, ASEE and AAAS, he is also very ac-

(Continued)

tive in the affairs of the American Institute of Chemical Engineers. He was a director of the institute from 1940 to 1942 and from 1946 to 1948. He has also served on the institute's chemical engineering education committee, the papers committee, the public relations committee, the constitution and by-laws committee. From 1942 through 1947 he was institute representative on ASA Z-10 committee on letter symbols and abbreviations.

In "Who's Who in Engineering" he is listed as a fisherman, numismatist and philatelist. From personal experience with two of these hobbies we would say that he can't be too serious about them. There just aren't enough hours in a day for all that work and hobbies too.—*LBP*

Less Noise

SOUND ABSORBING MATERIALS. By C. Zwikker and C. W. Kosten. Elsevier Publishing Co., New York. 174 pages. $3.

The underlying theory which may help provide designers of sound absorbing materials with a more scientific approach to their work has been set down here. Principles of wave propagation are described and emphasis has been placed on wave propagation through porous media. Theoretical and experimental data are set down and compared. Graphs and equations amplify most of the material.

The authors have explored the potentialities of absorbers of the resonator type. They conclude with a survey of the outlook and problems of the field.—*FA*

First

FLUORESCENCE AND PHOSPHORESCENCE. By Peter Pringsheim. Interscience Publishers, New York. 794 pages. $15.

Reviewed by A. L. Smith.

This book on photoluminescence must be regarded as the first modern authoritative and comprehensive treatment of the subject. As a reference work, it is no mere compendium of facts, but a critical review of the subject of photoluminescence by one of the foremost authorities. It is written clearly and concisely in an easily readable style.

The title of the book is somewhat misleading, since only fluorescence and phosphorescence induced by photoexcitation are described. This is regrettable, for other types of excitation could well bear Dr. Pringsheim's critical analysis. The philosophy that only theoretical applications are worthy of compilation, which apparently was one of the author's reasons for limiting his subject, cannot be commended. Were it not for the practical applications, such as fluorescent lighting and cathode-ray tubes, the interest in (and

(*Continued*)

RECENT BOOKS RECEIVED

Agricultural Chemistry, Vol. I. By D. E. H. Frear. Van Nostrand. $9.

Biophysical Research Methods. By F. M. Uber. Interscience. $9.50.

Chemistry and Metallurgy of Miscellaneous Materials. By L. L. Quill. McGraw-Hill. $3.

The Chemistry of Industrial Toxicology. By H. B. Elkins. Wiley. $5.50.

Data Book on Hydrocarbons. By J. B. Maxwell. Van Nostrand. $5.

Dissociation Energies. By A. G. Gaydon. Dover. $3.95.

Elastomers and Plastomers, Vol. I. By R. Houwink. Elsevier. $7.

Heterocyclic Derivatives of Phosphorus, Arsenic, Antimony, Bismuth and Silicon. By F. G. Mann. Interscience. $5.25.

How to Plan Pensions. By C. Boyce. McGraw-Hill. $5.

Natural Gas and Natural Gasoline. By R. L. Huntington. McGraw-Hill. $7.

Organic Chemistry. 4th English ed. By P. Karrer. Elsevier. $8.50.

Phenomena, Atoms and Molecules. By I. Langmuir. Philosophical Libary. $10.

Physical Chemistry of Electrolytic Solutions. 2nd ed. By H. S. Harned & B. B. Owen. Reinhold. $10.

Physical Chemistry of Hydrocarbons. By A. Farkas. Academic Press. $8.50.

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hence also the investigation of) phosphors would be as stagnant as it was 25 years ago when phosphors were still almost idle curiosities.

The book is divided into two main sections—Part I, "Fluorescence of Gases and Vapors," and Part II, "Fluorescence and Phosphorescence of Condensed Systems." Each is introduced by a thorough review of general physical theory, followed by a representative set of examples. All classes and types of luminescent base materials are included, with those contributing most to theoretical interpretation receiving the largest discussion. Throughout the book Dr. Pringsheim sifts the experimental evidence and critically evaluates it in terms of theory. He often emphasizes the contradictions and inconsistencies of both theories and experiments.

The bibliography of 2,000 references covers the field to an extent not previously accomplished. It is unfortunate, however, that the patent literature and papers on practical applications are not included. Adding to completeness of the subjects covered are 140 tables and 220 figures. The indexes, always of importance to a reference book of this character, are complete. The novel author-title-page reference index is timesaving and helpful.

The typography, binding, and general make-up of the book are excellent. Coated paper is used for the illustrations and uncoated paper for the text. The use of coated stock contributes a great deal to the quality of the illustrations but, when it is used for text, does have the disadvantage of providing a disconcerting glare.

Last of the Frontiers

FRONTIERS IN COLLIOD CHEMISTRY. *Edited by R. E. Burk and Oliver Grummitt.* Interscience Publishers, New York. 157 pages. $4.

Reviewed by Frederick C. Nachod

This eighth volume brings to a close the Western Reserve University lectures published under the title "Frontiers in Chemistry." It is devoted to selected topics in colloid chemistry. The six chapters comprise reviews on adsorption and catalysis (Hugh S. Taylor), chromatography (Harold H. Strain), ion exchange (Robert J. Myers), sedimentation (V. R. Damerell), colloidal electrolytes, wetting agents, detergents, and soap micelles (James W. McBain).

The subject matter is expertly handled by authorities and the individual chapters generally cover the literature up to 1946. No attempt to render a complete survey is made by the contributors, which is readily understood if one thinks of the chapters primarily as lectures.

Most of the work is well documented by factual information and data, but readers who are interested in geometrical speculations will find a full measure in the last two chapters furnished by Dr. McBain. This is not intended as a criticism but rather serves to illustrate the flux of ideas in "frontier" fields.

The booklet can be recommended for both the teacher and the industrial worker who wishes to acquaint himself with developments in thinking in colloid chemistry but who does not expect comprehensive coverage.

Toward Zero Pressure

VACUUM EQUIPMENT AND TECHNIQUES. By A. Guthrie and R. K. Wakerling. McGraw-Hill Book Co., New York. 264 pages. $2.50

Reviewed by Earl W. Flosdorf

This is Division 1—Volume I of a series prepared as a record of the research work, done under the Manhattan Project and the Atomic Energy Commission, specifically concerned with the development and study of high vacuum equipment by the personnel of the University of California Radiation Laboratory. The book compiles observations in the pioneering development of routine production of high vacuum in large systems on a scale never previously undertaken; i.e., in the operation of the electromagnetic separation process. As such it is a tribute to the unprecedented accomplishments of science, industry, government, labor and Army and Navy working as a team.

In presenting the fundamental considerations of vacuum practice involving parts of the kinetic theory of gases, it is assumed that the reader is already familiar with the theory but not necessarily with practice. Those parts of theory are presented without proof. Special equations of vacuum practice are developed in the book and discussed fully. Full references are given for all material of special interest in vacuum practice. Equations are given for calculating molecular flow through pipes, including application of Knudsen's formula, circular pipes, thin slit-like tubes, equilaterally triangular ducts and ducts of other shapes, bends and elbows, as well as for calculating pumping speeds and for their measurement. The pumping speed of cold traps is discussed.

There is full discussion of the elements of a vacuum system, including the design and operation of rotary oil-sealed mechanical vacuum pumps (backing pumps), various types of cold traps, booster and high vacuum jet and diffusion pumps, high vacuum valves and, finally, the construction of vacuum chambers and process tanks. A full chapter is devoted to vacuum materials and equipment with much detail given to welding, types of gaskets and grooves, flanges and valves. Extended discussion is given to means of producing motion within a vacuum chamber. Another chapter is devoted to vacuum gages and the discussion includes new types of McLeod gages and the various electrical gages which have been developed. There is satisfactory discussion of the limitations and applications of the various gages.

Relatively little attention has been devoted to the operational difficulties experienced with the large-scale vacuum installations in the Oak Ridge plant, this subject being covered elsewhere in the series. There is, however, a full chapter devoted to leak detection instruments and techniques. Some discussion is devoted to the theory of leak detection as well. There is an extended appendix which includes a summary of formulas useful in vacuum design, certain constants, conversion factors and physical properties. Also, there are lists of certain useful materials, oils, mechanical and diffusion pumps and the nature and source of miscellaneous vacuum materials.

The book is recommended to those interested in the design and operation of high vacuum systems.

Methodology

ELECTRON MICROSCOPY: TECHNIQUES AND APPLICATIONS. By Ralph W. G. Wyckoff Interscience Publishers, New York. 248 pages. $5.

Reviewed by Kurt G. Stern

It would be difficult to think of an author better qualified to write a monograph on the technique and applications of electron microscopy than Dr. Wyckoff. He has long-standing, first-hand experience in this difficult field of research. Moreover, he has a distinguished record as an experimental worker in X-ray crystallography, ultraviolet microscopy, and many other problems in biophysics and biology.

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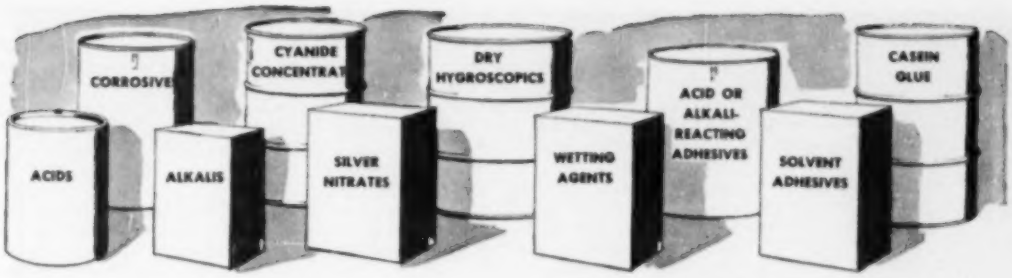

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The present monograph is a welcome companion volume to the treatise on "Electron Optics and the Electron Miscroscope" by V. K. Zworykin and his colleagues at the RCA Laboratories, published in 1946. In contrast to that volume, Dr. Wyckoff's book deals only briefly with the theory of electron optics and microscopy but is largely devoted to detailed discussions of methodology, e.g. the preparation of biological and other materials for study with the electron microscope, replica techniques, and the metal shadowing or shadow-casting method which he has developed to a high degree of perfection in collaboration with Dr. Robley Williams.

Of particular interest are the figures showing electron microscopes of foreign manufacture: the German Siemens, Dutch Philips, and French CSF instruments. Views of the British Metropolitan-Vickers and the Swiss Trüb-Täuber electron microscopes would have been equally welcome.

Perhaps the most outstanding feature of the monograph is its lavish illustration with electron micrographs of a great variety of biological (bacterial, viruses, muscle fibrils, etc.) and other objects. All of these electron micrographs were obtained by Dr. Wyckoff who thus further documents his mastery of this exacting art. The publishers are to be complimented on the excellent quality of the reproduction and of the book as a whole.

No More Illusion

PRINCIPLES OF ORGANIC CHEMISTRY. By James English, Jr., and Harold A. Cassidy. McGraw-Hill Book Co., New York. 512 pages, $5.

Reviewed by Robert L. Clarke

This is an unusually well organized book which seems to be based soundly on teaching experience. It is designed for use in a full-year course in beginning organic chemistry and should be especially valuable for students planning to study the subject further.

A departure from the usual order of presentation of this subject and the interpretation of reactions in terms of electronic theory have added stimulus to the subject. The book presupposes a thorough knowledge of first year college chemistry and, in the introduction, give definitions of such fundamental concepts as groups, ions, electrophilic and nucleophilic reagents, and electronegativity. Following this is a treatment of hydrocarbons which includes the paraffins, cycloparaffins, olefins, acetylenes, aromatic hydrocarbons, and the carbonaceous minerals. Alcohols and phenols are discussed together as are aliphatic and aromatic acids, etc. The simultaneous study of aliphatic and aromatic compounds with the same functional groups tends to destroy the popular illusion that organic chemistry is separated into two distinct divisions.

The authors recognize the necessity for memorizing much organic chemistry but have attempted to restrict their use of illustrations of reactions to a minimum and have eliminated much of the clutter of miscellaneous information so often thrown into a beginning organic text. Thus, many speicial-purpose reactions, and formulas of drugs, dyes, and natural products have been omitted.

Each chapter is concluded with an outline of the material presented and a series of problems and exercises.

The authors are to be congratulated on a very useful text.

Emphasis on Principles

FUNDAMENTALS OF SYNTHETIC POLYMER TECHNOLOGY. By R. Houwink. Elsevier Publishing Co., New York. 258 pages. $3.75.

Reviewed by Walter Brenner

This book—the latest to be published in Elsevier's Polymer Series—is a completely revised edition of "Technology of Synthetic Polymers" (1947) by the same author who enjoys a well earned reputation in the field of high polymers, both in this country and in Europe. Although a very extensive literature on polymer technology has been built up during the past few years, Houwink's latest volume represents, nevertheless, a definite and useful contribution to it because of the author's emphasis on basic principles in this book—a feature not shared by many other books in this field.

The author's treatment stresses the fundamental chemical and physical aspects of synthetic polymer technology in order "to enable the reader to understand its technological aspects and to interpret the results of tests and properties of the final products in the light of these basic principles" as stated in the preface to the book. This, it is believed, has been accomplished quite successfully with a minimum of mathematics etc. The work serves as an intermediate text between the purely descriptive books on polymer technology and the highly theoretical studies of polymer behavior. As such it is sure to appeal to an audience of both practical and theoretical workers in the field of high polymers by helping to bridge the gap between theory and practice which is so noticeable in this area of scientific endeavor.

An additional interesting aspect of Houwink's book is its approach to various problems. It often combines the latest and best features of both American and European views and methods, thus broadening the U.S. reader's point of view considerably.

The book has 16 chapters, the first three of which contain a discussion of some of the fundamental physical and chemical factors of polymer chemistry. They are the heart of the book and constitute 70 out of a total of 258 pages. The discussion is generally satisfactory within the mathematical limitations set by the author. This section is followed by a chapter on the properties and the testing of the properties of synthetic polymers which gives the salient facts of this subject quite well. A chapter on processing methods follows, describing briefly the principal methods used by the industry today. The remaining ten chapters comprise a study of the various types of synthetic polymers made commercially today in the light of the principles enunciated earlier in the first three chapters of this book. The treatment although necessarily brief touches most of the important points and gives a good summary of the state of the art in the various branches of the plastics industry. The final chapter touches on the economics of both plastomers and elastomers and is somewhat too sketchy to be of real use to workers in this field. Both the printing and the illustrations given are commendable for clarity and excellence of execution.

Ionic Viewpoint

MOLECULES AND CRYSTALS IN INORGANIC CHEMISTRY. By A. E. van Arkel. (Translated by J. C. Swallow.) Interscience Publishers, Inc., New York. 234 pages. $3.85.

Reviewed by David P. Shoemaker

This book represents an attempt to describe and explain the existence, structural properties, and relative stabilities of inorganic molecules and crystals in a simple and, where possible, quantitative or semi-quantitative way with a very heavy reliance on the concept of the ionic or heteropolar bond and with the least possible use of the covalent or homopolar bond.

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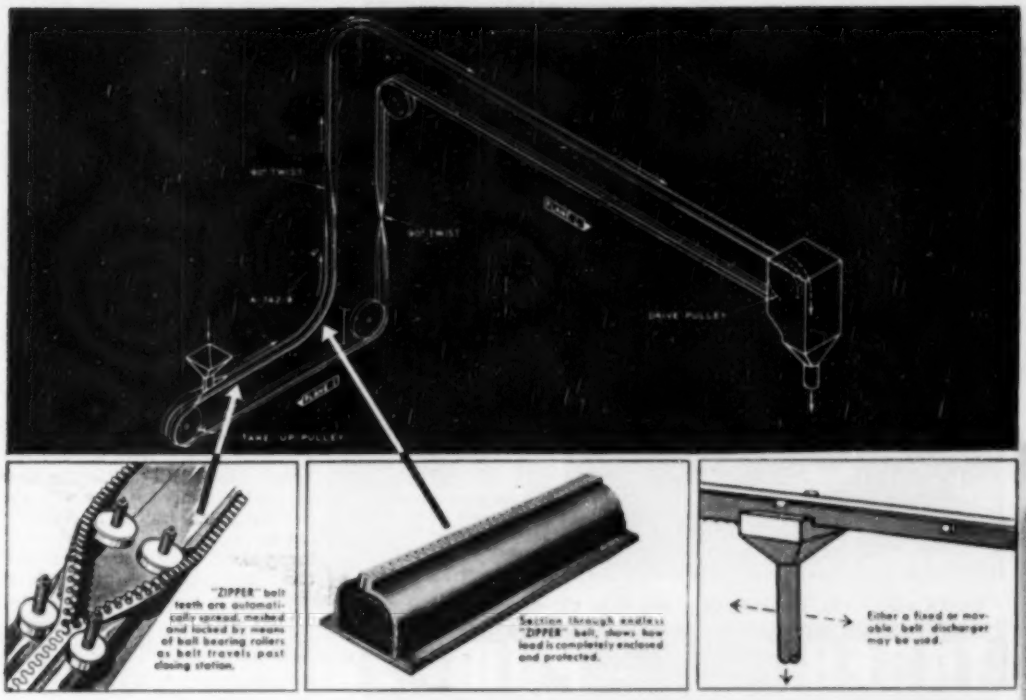
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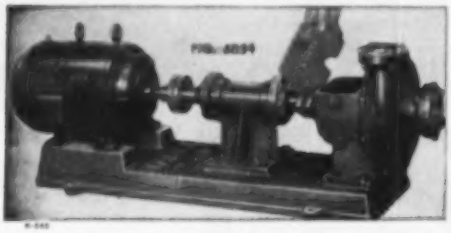

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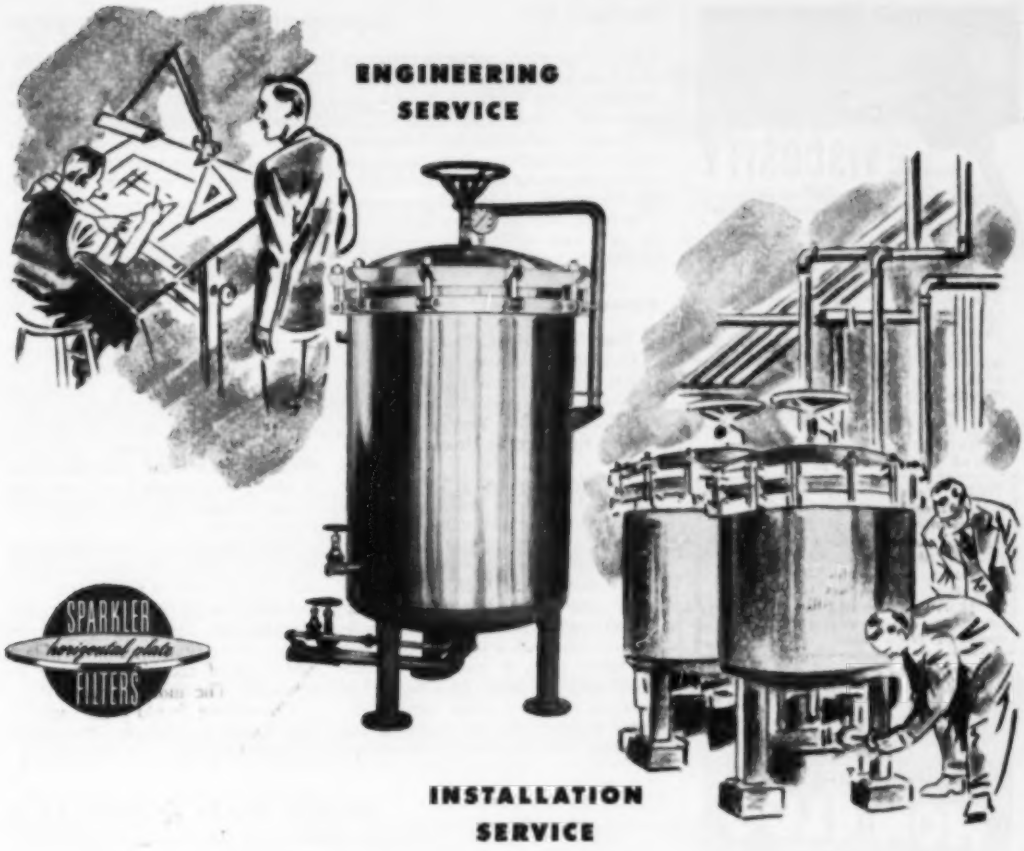
In the 205 pages occupied by the text exclusive of the appendix, the reader is first introduced to the theory of the ionic bond in a simple form (following Kossel), and then to an elementary treatment (along the lines of Madelung, Born and Haber, and others) of the structures and properties of ionic compounds and crystals insofar as these depend on ionic radii, ionization potentials, electron affinities, and the heats of dissociation or vaporization of the elements. A number of stability rules drawn from this treatment are then presented (see especially p. 64) and applied to the discussion of many so-called ionic molecules and crystals, including complex ions, acids and bases, silicates, hydrates, solutions, etc. Chemical reactions of various types are also discussed. In the final third of the book the author comes to grips with the fact that not all features of chemistry can be explained by the simple ionic theory alone. In a chapter on polarization a discussion is given of both induced and permanent dipoles, and the low symmetry of such molecules as water and ammonia is ascribed to polarization of the central "ion" by the peripheral ones. The ninth and last chapter, entitled "Non-Electrostatic Bonds," contains sections on van der Waals-London forces, covalent bonds, covalent-ionic bonds, and metallic bonds.

The translator states in his preface that the book is intended for students in their first year of science or medicine. Such use of the book is likely to be difficult, at least in first-year college chemistry courses in this country. A number of concepts which are usually considered to be of at least moderate difficulty for first-year students are introduced in this book with far from sufficient explanation. The book is by no means easy to read and in many places the line of thought is not clear or at least rather difficult to follow.

The author seems to have been motivated in part by the feeling that the ionic bond has been neglected too much in other books. While this feeling may have some justification, the heavy emphasis on the ionic bond in this book is likely to lead the beginning student toward an extreme which may be just as bad, although the author admits the shortcomings of the ionic theory when confronted with some of its obvious and drastic failures.

The book does not appear to contain many overt errors other than those resulting from the author's extreme ionic point of view. It is lacking in

(*Continued*)



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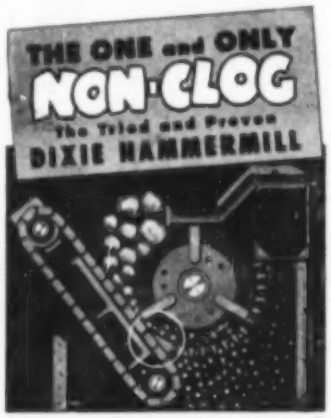

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many things which might be expected in a book having the title this one has, including even references to the experimental literature.

It must be admitted that the author does succeed rather well in correlating many phenomena in inorganic chemistry, often with considerable ingenuity. The book, without much doubt, can be read with profit by many an advanced student or mature chemist.

Canaries & Mice

THE ANALYTICAL CHEMISTRY OF INDUSTRIAL POISONS, HAZARDS AND SOLVENTS. Second edition. By Morris B. Jacobs. Interscience Publishers, New York. 788 pages. $12. Reviewed by Howard H. Fawcett

This second edition is Vol. I of the Chemical Analysis series of monographs being published on analytical chemistry and its applications. The author admits in the preface that certain material has been included to make the edition appeal to edutational users. Much of this background information is interesting, but in many cases it could have been condensed to good advantage. For example, nearly a whole page is devoted to use of canaries and Japanese waltzing mice for detection of carbon monoxide, where a few sentences would probably have sufficed. Another item treated in too much detail for such a volume is the six-page discussion of PVT relationships. On the other hand, the newer instrumental tools for such a volume is the six-page the mass spectrograph, and X-ray absorption, receive very little or no attention.

The general presentation of analytical methods is well prepared and includes clear directions and reliable procedures. The information supplied about the chemistry involved in the methods allows the experienced analyst to judge the usefulness of the procedures for new applications. The discussion of errors and accuracy is well presented.

Of considerable value are the specific references to commercially-available instruments and detectors, some of which are illustrated and described in detail. Limitations are pointed out where known.

The appendix contains several tables listing order of toxicity of gases and vapors, limits of flammability and explosive range, and probable safe concentration limits of exposure for vapors, dusts, fumes and mists. These tables are of considerable value for reference. The index is excellent.

The volume should prove useful to any chemist or engineer interested in industrial hygiene.

Recent Books & Pamphlets

Furfural Utilization Studies. By O. R. Sweeney and L. K. Arnold. Bulletin 169, published by Iowa Engineering Experiment Station, Ames, Iowa. 47 pages. Gratis. Discusses possible uses of material made from furfural for golf tees, chemically resistant tanks and bristle binder in paint brushes.

Papers Presented at the Eighth Conference of Coal Utilization. Engineering Experiment Station Circular Series No. 59, University of Illinois, Urbana, Ill. 151 pages. 75 cents. Fifteen papers present an educational program of technical and practical information.

A. S. T. M. Standards on Gaseous Fuels. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 98 pages. $1.15. Tests for calorific value of gaseous fuels by the water-flow calorimeter, for specific gravity of gaseous fuels and methods for measurement of gaseous fuel samples.

Stretching Highway Dollars with Rubber Roads. By Harry K. Fisher. Published by the Natural Rubber Bureau, 1631 K St., N. W., Washington 6, D. C. 26 pages. Summary of what has been done to date with natural rubber as a top surfacing for asphalt roads.

A. S. T. M. Standards on Petroleum Products and Lubricants. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 756 pages. $5.50. November 1949 compilation, issued annually. Methods of testing, specifications, definitions, charts and tables.

Graphical Methods As Applied to Extraction Problems. By Fred W. Bull and Guido J. Coll. Engineering Experiment Station Series No. 72, published by Virginia Polytechnic Institute, Blacksburg, Va. 62 pages. 50 cents. Written for students who are being introduced to this unit operation. Does not include discussions on more than three component systems.

Fire Hazard Index. Published by Randolph Laboratories, 8 East Kinzie St., Chicago. 36 pages. Gratis. Alphabetical list of chemical, gas and common fire hazard materials; specifies which type of fire-fighting agent to use on each, as recommended by the Board of Fire Underwriters and the National Fire Protection Association.

Traité de Galvanoplastie. By J. Salauze. Published by Dunod, 92, Rue Bonaparte (6e), Paris, France. 737 pages. 2,950 fr. Summary of the practical and theoretical developments of the last 30 years in the field of electrometallurgy. Written in French.

Iodine Abstracts and Reviews. Vol. 1, No. 3. Chilean Iodine Educational Bureau, Inc., 120 Broadway, New York 5, N. Y. 26 pages. Abstracts are divided into the classifications: organic, biological, inorganic, general and physical, and analytical chemistry.

Radioisotopes. Published by the Kellex Corp., 233 Broadway, New York, N. Y. 24 pages. Gratis. Survey of tracer and control work being done with radioisotopes; mainly concerned with industrial uses.

Hand Book of Conversion Factors. By Marvin H. Green. Published by Educational Publishers, Inc., 122 North 17th St., St. Louis 1, Mo. 68 pages. $1.50. Lists 2,500 conversion factors for use in mathematics, chemistry, physics, architecture and engineering.

Principles of a New Energy Mechanics. By Jakob Mandelker. Published by the Philosophical Library, 15 East 40th St., New York 16, N. Y. 72 pages. $2.75.

(Continued)

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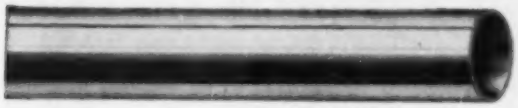

STRENGTH AT HIGH TEMPERATURES

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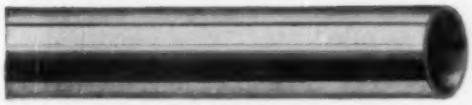

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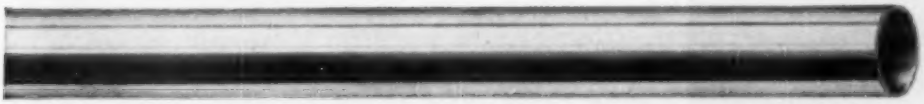

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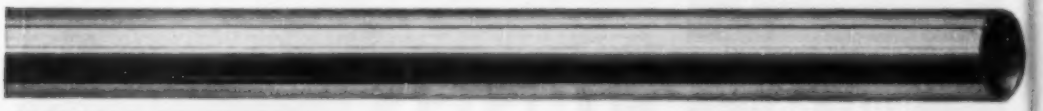

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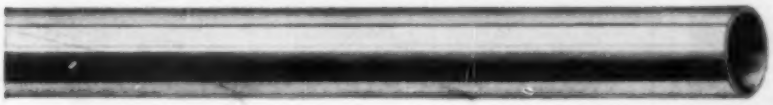

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BOOKSHELF, cont. . .

The mechanics presented here has been evolved from the same basic relations as Einstein's special theory of relativity, though not in the sense of his so-called postulates.

Why Glycerine for Drugs and Cosmetics? Published by Glycerine Producers' Association, Dept. P.R. 295 Madison Ave., New York 17, N. Y. 16 pages. Gratis. Outline of the general reasons for glycerine's use. Tables and charts give physical and chemical properties, origin and usage.

Introductory Chemistry. By C. W. Wood. Published by Macdonald & Co., Ltd., 37 Madison Ave., New York 16, N. Y. 160 pages. $1.95. A British textbook. The subject is presented so that the relation between the chemical principles, their history and everyday use is shown wherever possible.

Heat Inertia in Problems of Automatic Control of Temperatures. By Victor Broida. The Instruments Publishing Co., 921 Ridge Ave., Pittsburgh 12, Pa. 61 pages. $1. A method for solving process control problems using a concept of a "fictitious mass" of a heat-process unit under automatic control.

GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington 25, D. C. In ordering any publications noted in this list give complete title and issuing office. Remittances should be made by postal money order, coupons, or check. Do not send stamps. All publications are in paper cover unless otherwise specified. When no price is indicated, pamphlet is free and should be ordered from bureau responsible for its issue.

Atomic Explosion. "Damage From Atomic Explosion and Design of Protective Structures." Prepared for the National Security Resources Board by the Department of Defense and the United States Atomic Energy Commission. Price 10 cents.

Minerals Yearbook 1947. U. S. Bureau of Mines. Cloth bound. Price $4.25. Annual statistical report.

Lubricant Foaming. National Advisory Committee for Aeronautics recently released the following three Technical Notes: TN-2030—Variation with Temperature of Surface Tension of Lubricating Oils. By Sydney Ross. TN-2031—Comparative Foaming Characteristics of Aeronautical Lubricating Oils. By W. W. Woods, et al. TN-2032—Foaming of Mixtures of Pure Hydrocarbons. By J. V. Robinson, et al.

Water. "The Occurrence of Ground Water in the United States, With a Discussion of Principles." By O. E. Meinzer. U. S. Geological Survey, Water-Supply Paper 489. Price $2.25. This report has been reprinted.

Chromograph. "The Chromograph, A New Analytical Tool for Laboratory and Field Use." By Rollin E. Stevens, et al. U. S. Geological Survey, Circular 62.

Molasses. "The Marketing of Feed Molasses." By L. John Kutish. Production and Marketing Administration. Mimeographed. Important as factor in molasses

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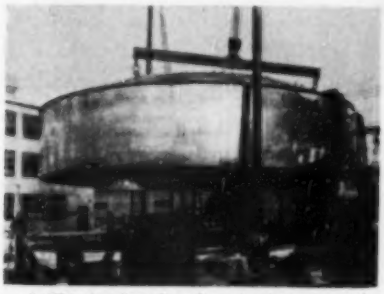
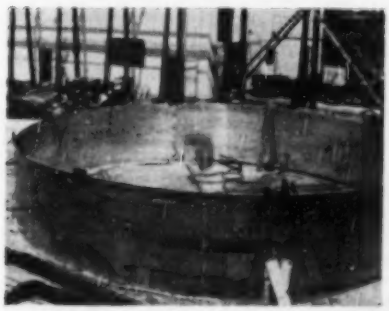


2. This view shows how the roof and top ring of the tank shell were hoisted off the ground and the second ring erected under them.



3. This view shows the lower ring of the tank shell and the bottom assembled along side the tank site. When the roof and top three rings of the shell were completed, this ring and bottom were moved under them and welded in place.

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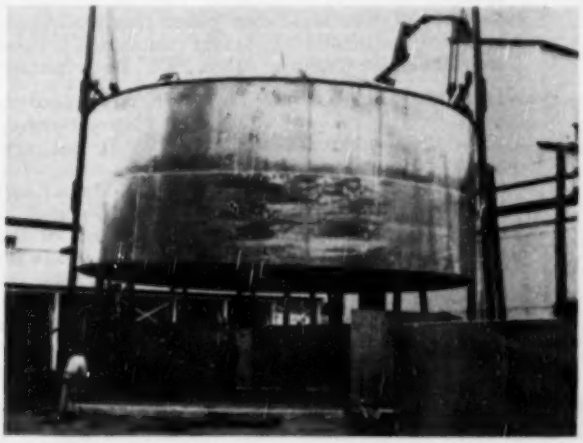

4. When the top two rings of the shell and the roof were completed, they were lifted off the tank foundation and the third ring of the shell was assembled under them and welded.

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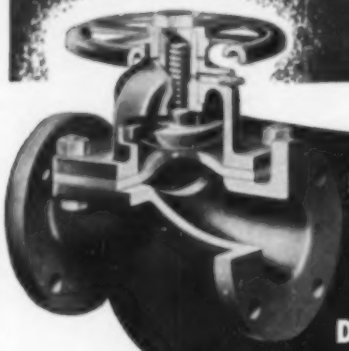

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Pulpwood. "Procedure for Determining the Properties and Characteristics of Pulpwood." Forest Products Laboratory, Madison 5, Wis. Report No. R1417 (Revised). Mimeographed.

Plastics. "Strength Properties of Plastic Honey Comb Core Materials." Forest Products Laboratory, Madison 5, Wis. Report No. 1805. Mimeographed. Summary of physical tests.

Insulation. "Thermal Insulation Made of Wood-Base Materials—Its Application and Use in Houses." Forest Products Laboratory, Madison 5, Wis., Report No. R1740. Mimeographed.

Wood Preservatives. Forest Products Laboratory, Madison 5, Wis., Report No. R149 (Revised). Mimeographed.

Sulphate Pulping. "Sulphate Pulping of Dead, Standing Jack Pine." Forest Products Laboratory, Madison 5, Wis., Report No. R1746. Mimeographed.

Phosphate Fines. "Agglomeration of Phosphate Fines for Furnace Use." Compiled by E. L. Stout. Tennessee Valley Authority, Chemical Engineering Report No. 4. Price 30 cents.

Munitions. "Stockpile Report to the Congress." Munitions Board. Processed. This is the semi-annual report to Congress required by law to give the status of accumulation and storage of strategic and critical materials.

Oil. "Oil Shales in Brazil." By A. J. Kraemer. Bureau of Mines, Report of Investigations 4655. Mimeographed.

Minerals. "Mines and Mineral Deposits (Except Fuels) Park County, Mont." By Glenn C. Reed. Bureau of Mines, Information Circular 7546. Mimeographed.

Pegmatites. "Economic Importance of Pegmatites." By Paul M. Tyler. Bureau of Mines, Information Circular 7580. Mimeographed.

Oil. "A Method of Resolving Oil-Field-Waste Emulsions." By J. W. Horne, et al. U. S. Bureau of Mines, Technical Paper 715. Price 50 cents.

Coal. "Investigation of Lower Coal Beds in Georges Creek and North Part of Upper Potomac Basins, Allegany and Garrett Counties, Md.: Reserves, Petrographic and Chemical Characteristics of Coals, and Stratigraphy of Area." By Albert L. Toenges, et al. U. S. Bureau of Mines, Technical Paper 725. Price $4.75, including several large maps.

Coal. "Carbonizing Properties of Thick Freeport and Pittsburgh Coals from Pennsylvania, Elkhorn Coal from Kentucky, and America and Mary Lee Coals from Alabama." By J. D. Davis, et al. U. S. Bureau of Mines, Technical Paper 726. Price 20 cents.

Food Analysis. "Methods for Microbiological and Chemical Determinations of Essential Amino Acids in Proteins and Foods." By Millard J. Horn, et al. U. S. Department of Agriculture, Miscellaneous Publication No. 696. Price 10 cents.

Synthesis. "Preparation and Purification of 2-Chloroethyl Vinyl Ether." "Copolymers of 2-Chloroethyl Vinyl Ether and Ethyl Acrylate." By C. E. Rehberg, et al. Bureau of Agricultural and Industrial Chemistry, AIC-255. Mimeographed.

Directory. "Importers of ECA Financed Commodities." Three volume Directory issued by Economic Cooperation Administration, Office of Small Business. Volume I includes food, feed and fertilizer; fuel; miscellaneous and unclassified. Volume II includes raw materials and semi-finished products. Volume III includes machinery and vehicles.

Safety. "Safe Handling of Radioactive Isotopes." Prepared for the National Bureau of Standards by the National Committee on Radiation Protection. Recommendations for the safe handling of artificially-produced radioactive isotopes in the typical laboratory or small industrial operation. Price 15 cents.

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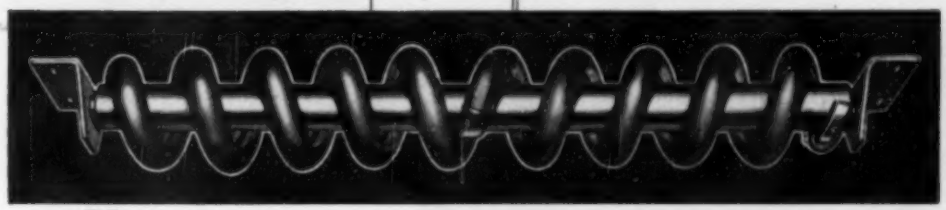
Subsequent Years (per year)	$66.80 for 4	$18.20 each (rubber covering)
SAVING per year after 1st YEAR		**$48.60**



Yes, the cost record from *just* this one plant clearly demonstrates the savings possible through the installation of Rex Rubber Covered Spiral Return Idlers.

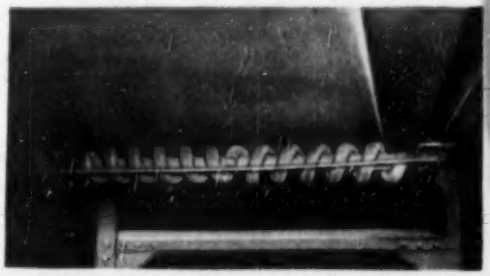
Before the installation of these cost-cutting idlers, the abrasive action of coke breeze clinging to the return side of the belts wore out the standard steel return idlers in an average 3-month period.

15 Rex Spiral Return Idlers were installed for trial and have given at least 12 months' service—4 times longer than the steel idlers. These idlers provide a constant, ever-changing point of contact between idler and belt, preventing build-up of material on the idler and, in some cases, helping to clean the belt.

Cost records show that the 15 Rex Spiral Return Idlers made possible a saving of $19.10 per idler and $286.50 total saving, including initial and installation costs. After the first year, the spiral rubber covering can be replaced, if worn, at a cost of $18.20 per idler. This cost as compared to $66.80, the cost of 4 new steel return idler rolls, indicates a saving after the initial year of $48.60 per year.

Add to these savings, the elimination of down-time caused by the frequent replacement of steel idler rolls, which makes the cost-cutting advantages of Rex Rubber Covered Spiral Return Idlers even more obvious.

Why not investigate the advantages of Rex Spiral Return Idlers and the other idlers in the Rex Line for your operations? Mail the coupon for your copy of Bulletin No. 463R.



Rex Rubber Covered Spiral Return Idlers installed in this western coke plant delivered 4 times longer service than conventional steel return idlers previously used.

CHAIN BELT REX COMPANY — BELT CONVEYOR IDLERS

Chain Belt Company
1648 W. Bruce Street
Milwaukee 4, Wis.

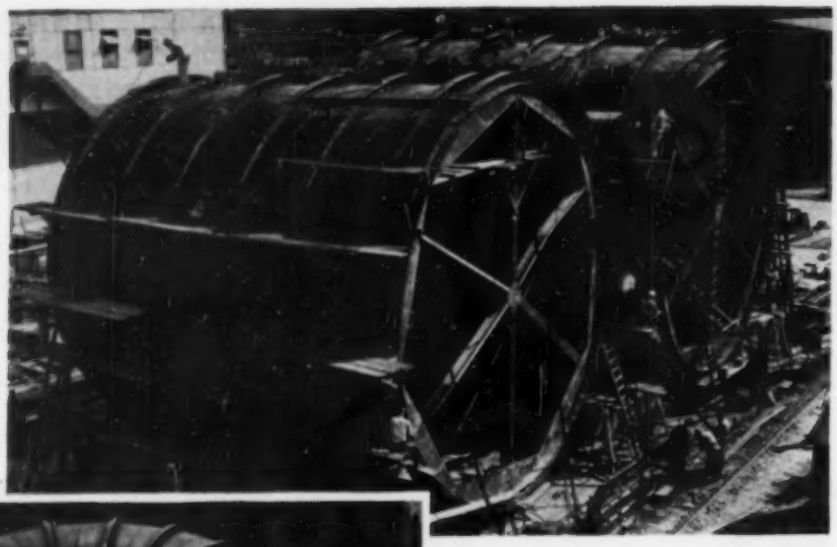
Please send me a copy of Bulletin 463R.

Name.....

Company..... *Dept*.....

Address.....

City..... *State*.....



TO HARNESS THE ELEMENTS

SHOWN are shop erections of sections of a wind tunnel and a water turbine spiral casing at Newport News. One to be used in the development of America's planes of the future, the other to generate power in the world's largest hydro-electric development.

Tolerances required for the 34-foot diameter welded structure of the wind tunnel were: flushness or smoothness plus or minus 0.01"; fairness of structures 0.03" and up to ☆" in diameter.

Eighteen of the 165,000 horsepower turbines at Grand Coulee have been built by Newport News. Nine sections of the casings are cast steel and six are welded and cast. These turbine units are the most powerful ever built.

Refractory towers, pressure vessels, bridge caissons and other heavy equipment of special design are fabricated at Newport News. The plant, over a mile in length, includes welding and steel fabricating shops, machine shops, foundries and forge shop to provide the advantages of building the complete job.

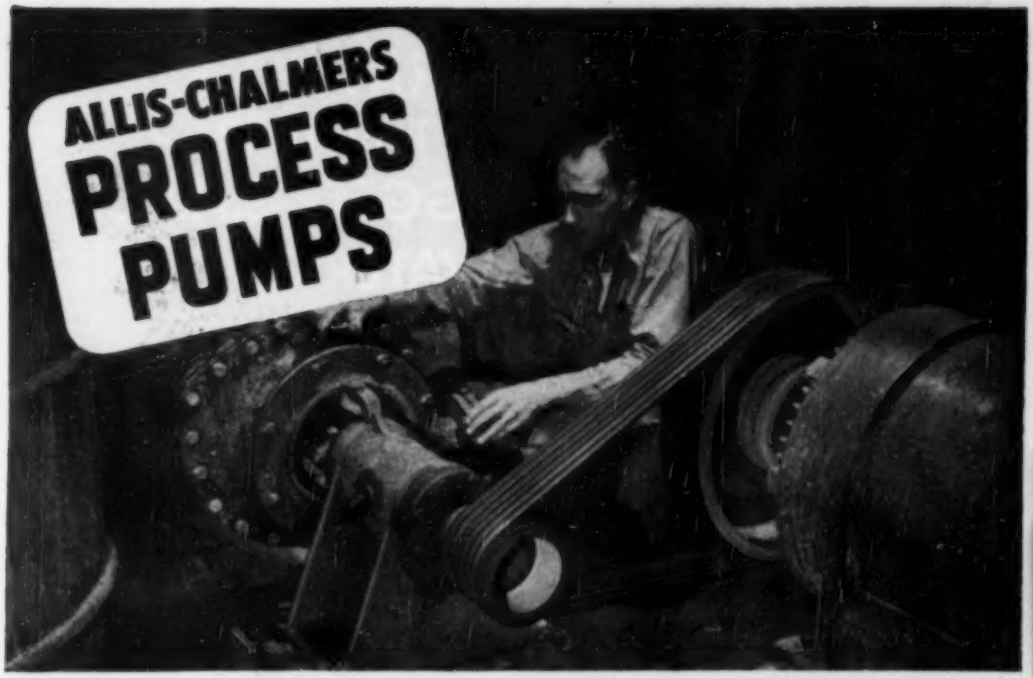
"Facilities and Products" catalog will be sent if requested.

BUILDERS OF EQUIPMENT FOR CHEMICAL, PETROLEUM AND PETRO-CHEMICAL INDUSTRIES

NEWPORT NEWS

SHIPBUILDING AND DRY DOCK CO.

NEWPORT NEWS, VIRGINIA



CUT PUMP GRIEF

ON ABRASIVE AND CORROSIVE JOBS

THIS ALLIS-CHALMERS PROCESS PUMP gives you many times the wear of an ordinary pump, even those made of special materials. One user had been replacing major parts in his old pump every six to ten weeks. An A-C process pump ran twenty months on the same job without repair. Here is why these savings are common:

UNIQUE DESIGN

Packing is on suction side. Pressure on packing is limited to suction conditions. This prevents excessive packing and shaft sleeve wear and leakage. Double volute casing balances hydraulic forces on rotating parts. Cuts vibration and eliminates pounding on operations where conditions vary, such as in pumping from filters.

Adjustment of wear between impeller and impeller wear plate may be made without dismantling pump. Parts subject to unequal wear are separated for easy, low-cost replacement.

4 MATERIALS IN STOCK

All parts are stocked in Aluminum Bronze, Ni-resist, 316 Stainless Steel and 18% Chrome Steel. You don't need to carry a spare parts stock. Only Allis-Chalmers can supply pump, motor, *Texrope* V-belt drive and motor control — all from one stock without waiting.

Ask your A-C Authorized Dealer or Sales Office representative to give you facts and figures on what A-C process pumps can do for you. Or write for Bulletin 08B6615.

A-2989

ALLIS-CHALMERS, 1147A SO. 70 ST MILWAUKEE, WIS.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

ALLIS-CHALMERS

TRAIN VIBRATIONS DON'T BOTHER RUGGED C.H.W. WATER COOLING TOWERS

Speeding express trains and thundering freights can cause serious vibrations with damaging effects on equipment located nearby. Here's a C. H. W. water cooling tower installed so close to one of the country's heaviest traveled railroads that passing trains nearly knock your hat off. This tower of The Bayer Company, aspirin manufacturers at Trenton, N. J., is as good as the day it was built. And there are many good reasons why they haven't had any "headaches" with it. In a C. H. W. cooling tower you get a sturdy structure, assembled by experts, with redwood members rugged enough to withstand stresses, strains and vibrations (caused by trains or most anything else up to hurricane winds of 100 m. p. h.). Wood fill is of sufficient size and weight to "stay put" without the use of nails, and vertical members are securely bolted. A distorted distribution system or wood fill "out of place" affects the efficiency of the tower—hence the reason for C. H. W.'s "vibration proof," rugged construction. For other exclusive features of C. H. W. towers, write for literature.

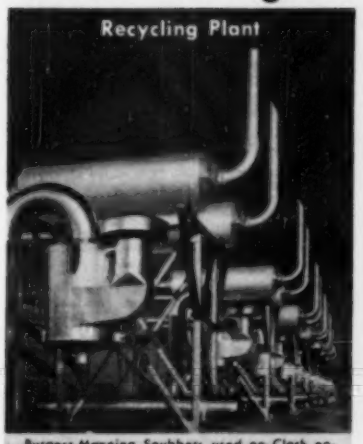
C. H. WHEELER MANUFACTURING CO.
1808 Sedgley Avenue, Philadelphia 32, Pa.
REPRESENTATIVES IN MOST PRINCIPAL CITIES

C. H. Wheeler
SINCE 1903

STEAM CONDENSERS · WATER COOLING TOWERS
EJECTORS · STEAM JET VACUUM REFRIGERATION
OF PHILADELPHIA

In the Petroleum Industry

Look to BURGESS-MANNING
Leader in Engine and Compressor Noise Reduction



Burgess-Manning Snubbers used on Clark engines at the Cotton Valley Recycling Plant.

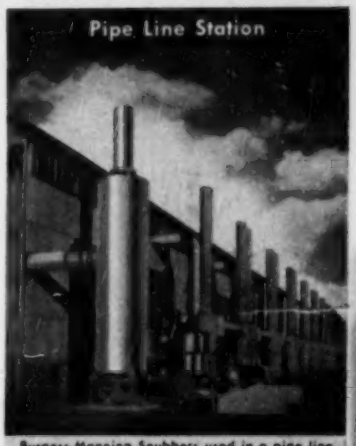
Burgess-Manning Snubbers on 180-hp gas engines used by a Kansas plant.

Almost twenty-five years' experience in the design and application of Snubbers has given Burgess-Manning the know-how to help solve your engine and compressor noise reduction problems.

Burgess-Manning Snubbers smooth the flow of exhaust gas or intake air without restricting gas flow. Exhaust or intake pulses of gas are effectively snubbed so that the oscillating flow of gas is smoothed to a unidirectional flow.

If you are installing engines or compressors, let Burgess-Manning submit Snubber recommendations. Long experience guarantees complete satisfaction.

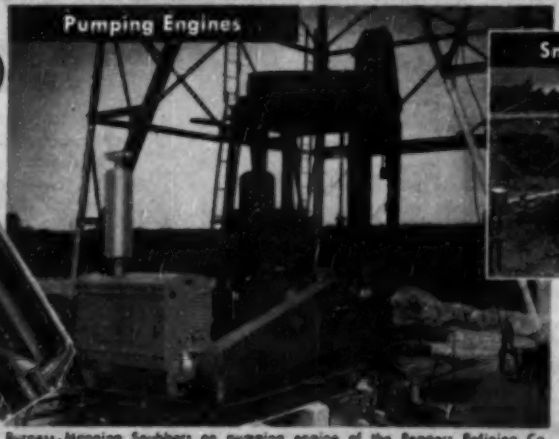
BURGESS-MANNING COMPANY
LIBERTYVILLE, ILLINOIS



Burgess-Manning Snubbers used in a pipe line station.

Burgess-Manning Snubbers used on engines of a pressure maintenance plant.

FROM WELL HEAD THROUGH THE REFINERY GATE . . . IT'S BURGESS-MANNING



Burgess-Manning Snubbers on pumping engine of the Peppers Refining Co.

Burgess-Manning Snubber installed on pipe line engine of the Magnolia Pipe Line Company.

STAINLESS STEEL FITTINGS

Double-sealing action gives you double protection against costly, dangerous line losses! Heavy-duty stainless steel construction insures peak corrosion resistance! And the exclusive, floating, Teflon-reinforced seat centers automatically even if the lines are installed off center! Only Koncentrik gives you these BIG 3 features in a complete selection of standard couplings for tubing to 1" O. D.

They're economical, too. Low in the first cost . . . and designed so that the parts can be reused over and over again. Send for descriptive bulletin K-149 today.

THE SPECIAL SCREW PRODUCTS CO.

5445 Dunham Rd., Bedford, Ohio

MANUFACTURERS' LATEST PUBLICATIONS

For a free copy of any of these publications, check the item's number on the Reader Service Postcard inside the front cover.

(324a)

Copper Tubes. American Brass Co., Waterbury 88, Conn.—64-page-publication C-24, fourth edition, illustrates and describes the uses of copper tubes in various industries. Includes tables of data on flow of water and friction loss through pipe and tubes, heat losses of copper tubes and Btu. carrying capacity of copper tubes.

(324b)

Heaters. Patterson-Kelley Co., 11 Burson St., East Stroudsburg, Pa.—36-page Bulletin 202 contains capacities of water heaters tabulated in gallons per hour with steam at various gage pressures. Includes dimension table and sketch showing typical piping arrangement.

(324c)

Steel and Alloy Plate. Nooter Corp., 1400 South Second St., St. Louis 4, Mo.—16-page Catalog No. 150 presents a pictorial story of the fabrication of steel and alloy tanks and pressure vessels. Includes corrosion data charts.

(324d)

Chlorine. Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio.—44-page handbook covers safe storage, handling, physical properties and use of chlorine. Illustrates and describes three standard-size cylindrical containers for liquid chlorine; gives instruction on use of proper chlorine service tools, equipment and accessories.

(324e)

Demineralizers. Barnstead Still & Sterilizer Co., 110 Lanesville Terrace, Forest Hills, Boston 31, Mass.—20-page Catalog No. 123 illustrates and describes the operation and uses of a line of water demineralizers. They run in size from 5 to 1,000 gph.

(324f)

Chemical Feeders. Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.—12-page Catalog 54, part 2, section 8, gives operating data and standard specifications for horizontal and vertical models. A 3-page sketch illustrates the working of the feeders.

(324g)

Steel Shafts. De Laval Steam Turbine Co., Imo-De Laval Products Division, Trenton 2, N. J.—20-page Bulletin G-7 contains formulas, curves and tables for determining proportions, stresses, combined torsional and bending loads in round, square, hollow, keyway and stepped shafts.

(324h)

Nitrogen Chemicals. American Cyanamid Co., Synthetic Organic Chemicals Dept., 30 Rockefeller Plaza, New York 20, N. Y.—48-page Vol. IV of a series called "Nitrogen Chemicals Digest." This one covers guanidine, its physical and chemical properties, synthesis, analysis, potential applications and toxicity.

(324i)

Cyanidation. American Cyanamid Co., Mineral Dressing Division, 30 Rockefeller Plaza, New York 20, N. Y.—40-page Bulletin 7 describes the fundamentals of cyanidation and zinc, copper and iron in cyanidation. The review integrates the company's own work and abstracts from publications of other investigators.

(324j)

V-Belts. Allis-Chalmers Mfg. Co., 1147 South 70th St., Milwaukee, Wis.—4-page inventory survey check list carries standards to help users determine the condition of their belt sets.

(324k)

Corrosion Resistance. Maurice A. Knight Co., Kelly Ave., Akron 9, Ohio.—4-page Bulletin 1B gives dimensions, corrosion

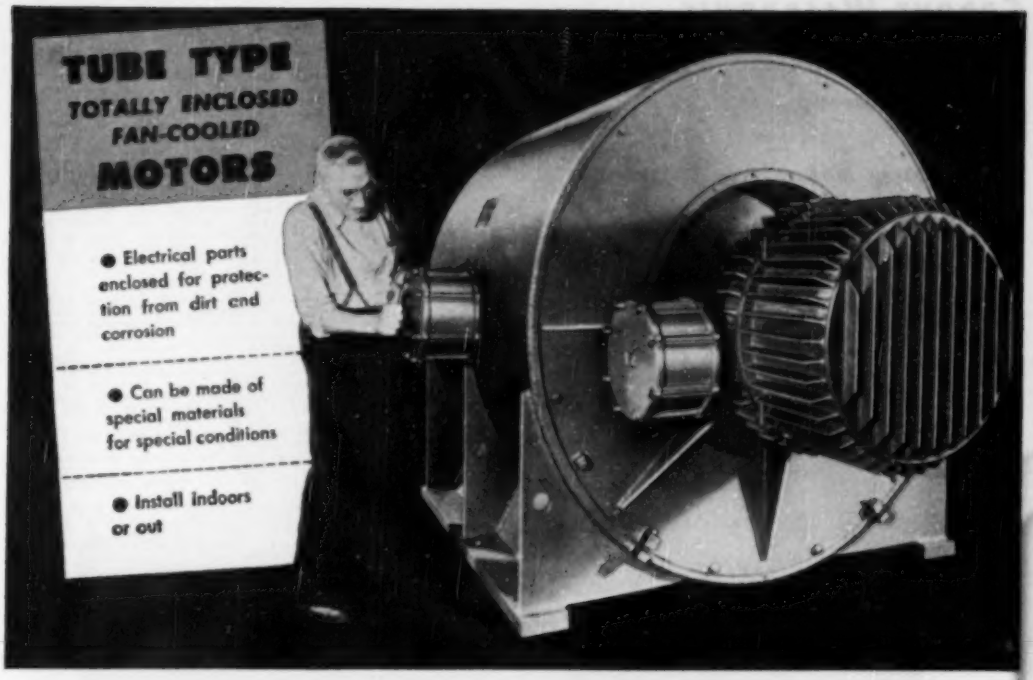
(*Continued*)

CALL SPERRY FOR ANY FILTER BASE

Paper, cloth, vinyon, nylon, orlon, glass and woven metals ... plus other special materials ... are regularly carried in Sperry's large stock of filter bases. Call Sperry today for the base you need.

D. R. SPERRY & CO.
Batavia, Illinois
Filtration Engineers for Over 50 Years

SPERRY FILTER BASES


TUBE TYPE
TOTALLY ENCLOSED
FAN-COOLED
MOTORS
● Electrical parts enclosed for protection from dirt and corrosion
● Can be made of special materials for special conditions
● Install indoors or out

DIRT'S OUT...
AND SO IS CORROSION!

YOU KEEP DIRT and chemicals away from all electrical parts — including stator core with Allis-Chalmers tube-type motor. In addition, tubes, stator end plates, and external fan can be made of corrosion resistant metals that will not be attacked by atmospheric acids or alkalies.

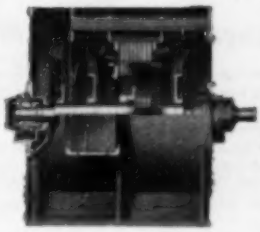
Cleaning is rarely needed because air passages are unrestricted. Air flow is through straight tubes. Residual foreign matter is reduced to a minimum.

This unique cooling system for motors reduces maintenance to a point never before reached in totally enclosed motor design.

Install this motor indoors or outdoors in any atmosphere. Important savings have been proved by years of field operation. Sizes from 75 hp and up. Also explosion proof designs. And you can match these motors with Allis-Chalmers starters. For complete information outline your requirements to your A-C Sales Office, or write for Booklets 7149 and 7150.

A-5037

ALLIS-CHALMERS, 1147A SO. 70 ST
MILWAUKEE, WIS.



HOW TUBE-TYPE COOLING SYSTEM SAVES YOU MONEY ON MAINTENANCE

1. LARGE HEAT TRANSFER AREA of tubes plus efficient air flow removes heat quickly.
2. STRAIGHT TUBES do not normally clog or collect moisture and foreign matter.
3. INTERNAL FANS keep enclosed air constantly circulating, assuring even cooling and fast heat dispersal.
4. EXTERNAL FAN blows air through tubes to remove heat quickly and efficiently. Air speed keeps tubes clean.
5. ALL ELECTRICAL PARTS ARE ENCLOSED: Dirt cannot enter.

ALLIS-CHALMERS

SPROUT-WALDRON'S

PNEU-VAC

THE MODERN AIR CONVEYOR SYSTEM

for handling bulk materials

POWDERED
GRANULATED
FLAKED
GRATED
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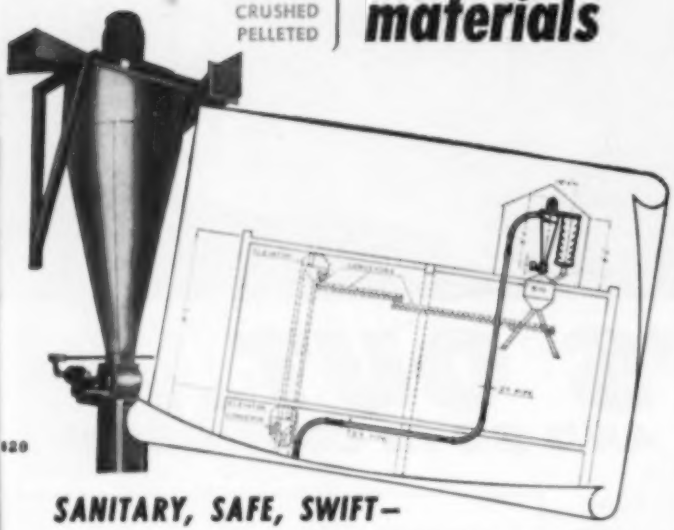


SANITARY, SAFE, SWIFT—

SAVES time, labor, SPACE and MONEY

Pneu-Vac, the modern conveyor system, is rapidly changing the old concepts of bulk materials handling. Adaptable to almost any conveying situation, it replaces bucket elevators and screw conveyors, steps up production and provides sanitary products handling.

Specially engineered for individual processing needs, Pneu-Vac prevents the accumulation of materials within the system, eliminates dust, and improves working conditions. Because materials do not pass through fan blades, quiet operation and low maintenance costs are assured and costly breakdowns avoided.

Installation requires small space—if you have room for a conveying pipeline you can have Pneu-Vac in your plant.

Investigate how this up-to-the-minute system can modernize your bulk materials handling and greatly increase your operating efficiency. Write for Bulletin 18c.

Address Sprout, Waldron & Co., Inc.
15 Waldron Street, Muncy, Penna.

LOOK TO SPROUT-WALDRON for BETTER PROCESSING EQUIPMENT

Sprout, Waldron
Manufacturing Engineers
SINCE 1869 MUNCY, PENNSYLVANIA

Size Reduction • Mixing and Blending
Bulk Materials Handling • Product Classification • Pelleting and Special Facilities

MFRS.' PUB., cont. . .

data and physical properties of pipe and fume ducts made of a furan resin material reinforced with chemical glass fabric. 4-page Bulletin 2B describes a thermoplastic sheet lining for the protective lining or covering of steel or concrete vessels or equipment in corrosive service. 5-page Bulletin 3B describes the uses of a lacquer (formulated of chemically inert synthetic resins) as a corrosion resistant surface coating. 4-page Bulletin 4B covers resin cement.

(326a)

Alloys. Ampco Metal, Inc., Milwaukee 15, Wis.—16-page booklet gives physical properties and corrosion data. Some products manufactured from the alloys are described and welding techniques are summarized.

(326b)

Surface Active Agents. Armour and Co., Chemical Division, 1355 West 31st St., Chicago 9, Ill.—28-page booklet describes the characteristics and reactions of polyethylene glycol derivatives of fatty amines, fatty amides and fatty acids. Describes uses; suggests formulas for many specific applications. Includes 12 pages of bar charts showing solubility characteristics in various solvents at 25 deg. C.

(326c)

Instruments. Energy Control Co., 5 Beekman St., New York, N. Y. — 16-page booklet contains articles describing the construction and use of an oxygen recorder and other control instruments.

(326d)

Equipment. Strohecker Inc., Enon Valley, Pa.—8-page booklet illustrates and describes the types of heat and corrosion resistant equipment which this company fabricates.

(326e)

Mixers. Patterson Foundry and Machine Co., East Liverpool, Ohio.—4-page leaflet contains sketches and descriptions of two dispersion-type mixers, one for industrial finishes and one for general purposes. 8-page leaflet includes photographs and operating details on mixers from ¾ gal to 2,000 gal capacities.

(326f)

Water Stills. Precision Scientific Co., 3737 West Cortland St., Chicago 47, Ill.—6-page Bulletin 910 includes a cutaway drawing and illustrations of various parts.

(326g)

Bromine. Dow Chemical Co., Pharmaceutical Sales Department, Midland, Mich.—Brochure covers for liquid bromine: safety precautions, methods and materials for handling, handling and use from glass bottles, lead-lined drums and tank cars.

(326h)

Ion Exchangers. Permutit Co., 330 West 42nd St., New York 18, N. Y.—12-page Bulletin 2508 summarizes the properties and uses of a number of ion exchangers.

(326i)

Protective Coatings. Atlas Mineral Products Co., 41 Walnut St., Mertztown, Pa.—8-page Bulletin 7-1 describes coatings for protection against corrosive fumes or splash on steel, concrete and wood surfaces.

(326j)

Rotameters. Schutte and Koerting Co., Dept. M-A, 12th and Thompson Sts. Philadelphia 22, Pa.—Bulletin 19-RB pictures and describes a line of rotameters utilizing a high capacity fluted rotameter tube. Gives sizes, dimensions and capacities for liquids and gases.

(326k)

Air Diffusers. Anemostat Corp. of America, 10 East 39th St., New York, N. Y.—68-page Manual 21 includes illustrations, dimensional and performance data for each member of the line. Cutaway sections show completed installations.

(326l)

Chemicals. Glyco Products Co., 26 Court St., Brooklyn, N. Y.—Four catalogs give chemical, physical and application data on all products manufactured by this company. 24-page catalog covers polyhydric alcohol fatty acid esters. 12-page booklet covers synthetic waxes; and 8-page catalog describes new products for the food industry including glyco and glyceryl monostearates, partial esters of edible fatty acids. 20-page manual explains how to use raw materials, such as glyceryl monostearates and diglycol stearates, in cosmetic formulation.

(326m)

Packings. Greene, Tweed & Co., c/o Walter Josephson, North Wales, Pa.—4-page Bulletin LP-10 covers the principles of self-lubricating packing design, structure and performance. Illustrations and specifications for various packings are in-

(Continued)

STURTEVANT DUSTLESS BLENDERS

Thoroughly Blend Substances into an Inseparable Mass

The 4-Way Mixing Action of the Sturtevant Dustless Blenders thoroughly mixes two or more substances into an inseparable whole . . . every part of which is the same analysis. Single receiving and discharging opening insures tight sealing during mixing process. "Open-door" accessibility permits thorough cleaning. The fast, accurate mixing operation increases output . . . cuts mixing costs. Available in many sizes with mixing capacities from ¼ ton to 75 tons per hour. Write for information and catalog.

Receiving — The ingredients to be mixed enter the mixing chamber of drums through a chute. Note scoops which carry up and dump the ingredients as drum rotates assuring a more uniform mix.

Discharging — Throwing a lever closes the inlet and mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients.

The Sturtevant Mill Company

100 Clayton Street, Boston 22, Massachusetts

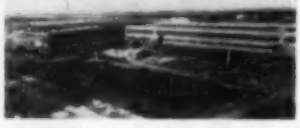
Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

For Alabama Pulp & Paper Company, M-C & S built this 200-ton kraft mill and bag factory at Cantonment, Fla. Hardy S. Ferguson & Company — Consulting Engineers.

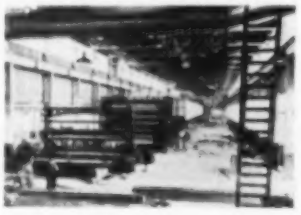
As builders for industry,

MERRITT-CHAPMAN & SCOTT has built a great reputation!

From many of America's leaders in industry and commerce, Merritt-Chapman & Scott has received 2 to 40 repeat construction contracts — proof of client satisfaction resulting from earlier projects completed exactly as desired and within the specified time. To each project, large or small, M-C & S brings an organization with extensive knowledge in every building field . . . specialized facilities that assure economy, efficiency and speed. Talk with the men of Merritt-Chapman & Scott if you are planning a new plant or addition. They will take your construction problems off your hands completely —even to purchasing, expediting and installing of equipment.



Above: Panorama of Alabama Pulp & Paper bag factory, finishing and machine rooms under construction by Merritt-Chapman & Scott. Below: Paper machine being installed. M-C & S constructed all buildings, expedited and installed all equipment, piping and electrical facilities. Consulting Engineers—Hardy S. Ferguson & Company.



MERRITT-CHAPMAN & SCOTT
CORPORATION

Founded in 1860 . . . now in our 90th year

GENERAL OFFICES
17 Battery Place, New York 4, N. Y.

BOSTON • CLEVELAND • NEW LONDON • PASADENA, TEXAS

cluded as well as recommendations for specific services.

(328a)

Motors. Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio.—4-page flyer describes motors made for application in locations where explosive conditions exist. Sizes range from ¾ to 125 hp.

(328b)

Boiler Tubes. Babcock & Wilcox Tube Co., General Sales Office, Beaver Falls, Pa.—Price sheets for seamless carbon steel boiler tubes show, in tabular form, prices per hundred feet for all quantity brackets.

(328c)

Alums. C. Tennant, Sons & Co., 356 Fifth Ave., New York, N. Y.—Three technical data sheets cover ammonia alum, potash alum and aluminum sulphate (iron-free) manufactured by Peter Spence & Sons, Ltd., England.

(328d)

Welding. All-State Welding Alloys Co., 272 Ferris Ave., White Plains, N. Y.—32-page pocket-sized booklet on low-temperature welding and brazing rods and fluxes. Contains tables of characteristics, application information.

(328e)

Materials Handling. Link-Belt Speeder Corp., 307 North Michigan Ave., Chicago 1, Ill.—Catalog 2322 contains applications, construction details and specifications for a truck-mounted shovel crane with hydraulic controls.

(328f)

Instruments. Asch Equipment Co., 98-11 Queens Blvd., Forest Hills, N. Y.—4-page leaflet describes an automatic manometer which indicates the height of a liquid column in digital figures at a local or remote station.

(328g)

Dust Collectors. Aget-Detroit Co., Ann Arbor, Mich.—4-page Bulletin 616 contains illustrations and tabulated specifications of a line of unit type dust collectors.

(328h)

Generators. York-Shipley, Inc., 246 Jessop Pl., York, Pa.—Seven 4-page leaflets describe a complete line of automatic generators. Types of generators described are: gas fired for natural, manufactured or mixed gas; oil fired for light fuel oil; combination firing for No. 3 oil and gas; oil fired for No. 5 fuel oil; combination firing for No. 5 oil and gas; heavy oil fired for heavy Bunker C oil; combination firing for No. 6 oil and gas.

(328i)

Instruments. Consolidated Engineering Corp., 620 North Lake Ave., Pasadena 4, Calif.—4-page Bulletin 1410A describes performance, operation and specifications of a recorder for trace quantities of sulphur compounds.

(328j)

Process Equipment. Schutte and Koerting Co., Dept. J-A, 12th and Thompson Sts., Philadelphia 22, Pa.—36-page Bulletin 2-M pictures and describes a complete line of water jet eductors for use in the lifting, pumping, mixing and agitating of liquids and the handling of solids and slurries.

(328k)

Instruments. Tracerlab Inc., 130 High St., Boston 10, Mass.—90-page Catalog B includes illustrations and descriptions of such equipment for radioactivity applications as scalers, scaler accessories, preamplifier and tube accessories, Geiger-Mueller tubes and lead shields. 6-page leaflet describes a gage to measure the thickness of coatings on all types of backing materials as well as the thickness of sheets or film on calendering rolls.

(328l)

Mixers. Patterson-Kelley Co., 11 Burson St., East Stroudsburg, Pa.—4-page Catalog section 401 describes and illustrates a mixing apparatus for blending dry materials. It consists of two cylindrical shells of equal diameter joined together to form a V rather than a long straight tube.

(328m)

Dehumidifier. Industrol Corp., 88-35 76th Ave., Glendale, Brooklyn 27, N. Y.—1-page Bulletin DD-110 gives description and operating data on a cabinet model dehumidifier.

(328n)

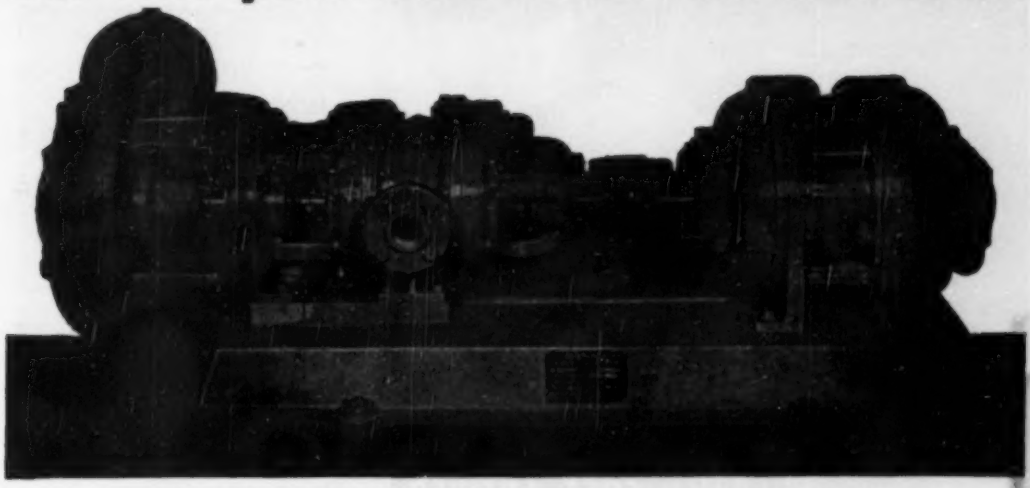
Organic Chemicals. Smith—New York, Inc., Freeport, L. I., N. Y.—24-page catalog lists prices of this company's chemicals for laboratory use.

(328o)

Instruments. Kelley-Koett Instrument Division, 6 East Sixth St., Covington, Ky.—Vol. I, No. 1 of a bi-monthly publication entitled "Kelefax" for personnel engaged

(Continued)

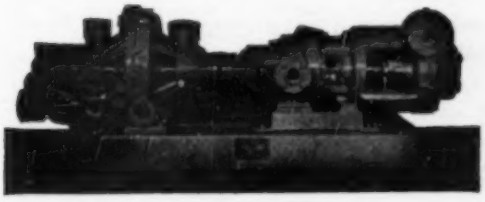
Nash—the Perfected Vacuum Pump for Evaporators and Condensers



COMBINATION VACUUM REMOVAL UNIT ESPECIALLY DESIGNED FOR SATISFACTORY OPERATION ON CONDENSERS WITHOUT BAROMETRIC LEG

Especially designed for drawing air and liquid from high vacuums, the Nash Vacuum Removal Unit is an efficient combination of a standard Nash Vacuum Pump and a Jennings Centrifugal. This design may be had in either motor or steam turbine drive, and may be installed with confidence that it will operate perfectly.

Nash Vacuum Pumps for Evaporator and Condenser Service offer unusual advantages. Vacuum is non-pulsating, producing uniform operating conditions and assuring a better product. Nash Vacuum Pumps have no valves, gears, pistons, rings, or mechanical complications. The single moving element rotates without metallic contact, and no internal lubrication is required. In standard design these pumps maintain vacuums up to 27" of mercury.



THE NASH VACUUM REMOVAL UNIT MAY BE HAD EQUIPPED WITH STEAM TURBINE DRIVE WHERE THIS TYPE IS PREFERRED

Nash Pumps are compact, and require but a fraction of the space taken by old type equipment. They may be installed where convenient, and they operate at suitable speeds for direct connection to either electric motors or steam turbines. Nash engineers will be glad to recommend proper equipment to exactly meet your particular requirements.

NASH ENGINEERING COMPANY

SOUTH NORWALK • CONNECTICUT, U. S. A.

DINGS NON-ELECTRIC MAGNETIC PERMA-PULLEY

Above—removing tramp iron from roofing scrap at plant manufacturing asphalt expansion joints. To protect expensive mixer blades and knives.

NEWER, BETTER, LOWER COST ANSWER TO YOUR MAGNETIC SEPARATION JOBS

INSTALL a self-energized, permanent Alnico magnet Perma-Pulley at the head of your conveyor and your tramp iron troubles are over. Great power . . . magnetic strength certified . . . magnetic permanence *guaranteed* for the life of the unit! Also available in complete separator units which can be fed by belt, chute or hand. WRITE FOR CATALOG C-1007A.

Above—look at the iron being grabbed by this Perma-Pulley installed in a continuous screw press in a large rendering plant.

The Magna-Trap for taking iron out of liquids conveyed through piping. Available in sanitary models. WRITE FOR BULLETIN.

Dings MAGNETIC SEPARATION Reg. U.S. Pat. Off.

DINGS MAGNETIC SEPARATOR CO.
4720 W. Electric Ave., Milwaukee 14, Wis.
50 Years the Leader!

MFRS.' PUBS., *cont.* . . .

in radiation and industrial instrumentation, nuclear science and technology.

(330a)

Valves. Klipfel Mfg. Co., 1000 Weller Ave., Hamilton, Ohio. 24-page Bulletin 144 contains clearly labeled diagrams of the members of a line of reducing valves. Operation and construction are discussed. Prices, dimensions, capacity data and weights are tabulated.

(330b)

Fire Safety. Solvay Sales Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.—23-page pocket-sized booklet entitled "Stop Small Fires From Growing Up" describes the use of calcium chloride in first aid fire fighting equipment. Explains how calcium chloride may prevent freezing, evaporation and fouling.

(330c)

Welding. Electric-Arc, Inc., 152-162 Jelliff Ave., Newark 8, N. J.—2-page catalog sheet illustrates and describes induction heaters and control instruments for preheating before welding and stress relieving after welding.

(330d)

Chemicals. J. T. Baker Chemical Co., 122 East 42nd St., New York 17, N. Y.—8-page price list of this company's fine and industrial chemicals.

(330e)

Control Panels. Hays Corp., Michigan City, Ind.—8-page Bulletin 773 explains how the panels are made and where they are used. Photographs show various sizes, shapes and designs.

(330f)

Electrostatic Precipitation. General Electric Co., Apparatus Dept., Schenectady 5, N. Y. 16-page Bulletin GEA-5212 explains the working of this method of controlling small particles of matter. Describes typical installations and the equipment used.

(330g)

Graphic Recorders. Esterline-Angus Co., Indianapolis, Ind.—16-page pocket-sized booklet describes various types of recorders and how they may be used.

(330h)

Insulation. Great American Industries, Inc., Rubatex Division, Bedford, Va.—20-page booklet covers the use of insulation hardboard for low-temperature purposes.

(330i)

Plasticizers. Binney & Smith Co., 41 East 42nd St., New York 17, N. Y.—3-page Bulletin P-1 gives the properties and composition of a line of plasticizers for vinyl plastics.

(330j)

Liquid Cooler. Doyle & Roth Mfg. Co., 136-50 24th St., Brooklyn 32, N. Y.—4-page leaflet describes a packaged liquid cooler available in sizes from 5 to 100 tons of refrigeration. Includes a typical flow diagram.

(330k)

Separators. Bauer Bros. Co., 1725 Sheridan Ave., Springfield, Ohio.—4-page Bulletin M-3-A illustrates and describes a line of permanent magnetic separators.

(330l)

Ceramics. Illinois Clay Products Co., Joliet, Ill.—6-page leaflet illustrates and describes the uses of fire clays and fire bricks.

(330m)

Plastics. Continental-Diamond Fibre Co., Newark 8, Del.—28-page Catalog DC-56 discusses the properties, manufacture and uses of laminated and molded thermosetting plastics.

(330n)

Instruments. Diamond Power Specialty Corp., Lancaster, Ohio.—16-page Bulletin 1025 describes a system of wired television for watching a location which it is not practical to observe directly. The equipment includes a camera and a viewer. Numerous applications are illustrated.

(330o)

Safety. General Scientific Equipment Co., 2700 West Huntington St., Philadelphia 32, Pa.—48-page catalog of personal protective equipment and industrial safety devices. Covers respiratory devices, eye protection, hats, gloves, carboy pumps, drum pumps.

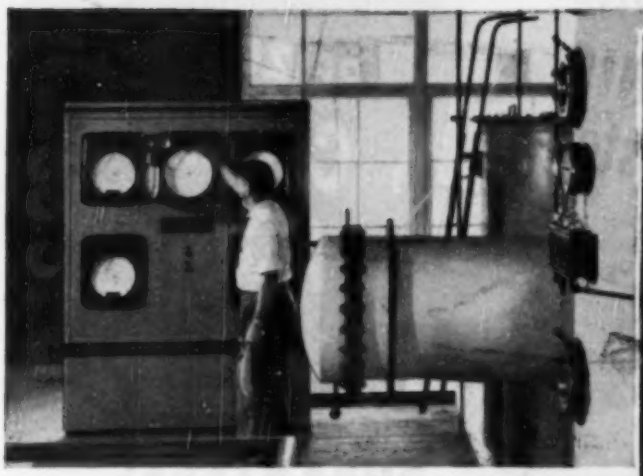
(330p)

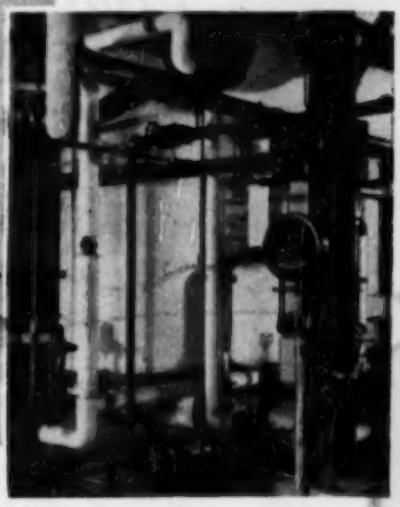
Vacuum Calculator. F. J. Stokes Machine Co., 5900 Tabor Rd., Philadelphia 20, Pa.—Cardboard slide-rule device with which the following can be determined: needed pump capacity to evacuate a given volume to a specified vacuum in a given time; time required to evacuate a given volume to a specified vacuum with existing vacuum pumps; vapor pressure of water at various temperatures; boiling points of solvents under vacuum; capacity of round tanks in both cu. ft. per ft. and gal. per ft. Price is 50 cents.

—*End*

AUTOMATIC EVAPORATOR CONTROL

raises quality . . . lowers cost





Promising to pay for itself in less than a year through new, over-all economies, this fully automatic Foxboro Cabinet Control System is giving precise, round-the-clock operation of Zaremba Evaporators at the American Thread Company's Kerr Mill, Fall River, Mass. *At right* — on the floor below, a Foxboro Indicator transmits thin liquor flow measurement to cabinet-mounted recorder.

A New Opportunity to Modernize Another Important Chemical Process

Accurate, coordinated control of variables, by means of this Foxboro development, improves evaporating efficiency four ways: (1) it increases evaporator capacity, saving time and money; (2) it releases manpower from purely routine duties; (3) it eliminates the inaccuracies of spot sampling; (4) it assures uniformly concentrated end-product.

If you have, or are planning a process involving evaporation, why not investigate the advantages offered by fully automatic Foxboro control? **Ask your** nearby Foxboro Field Engineer for further information, or write **The Foxboro Company, 16 Neponset Ave., Foxboro, Mass., U. S. A.** Branches in principal cities.

• • •

5 OUTSTANDING FUNCTIONS of the control system shown above

1. *continuously records and controls by electronic comparison of solution's boiling point to boiling point of water at the same pressure . . . and automatically adjusts steam input as required. This is an original Foxboro system, known as "boiling point rise" control —*

2. *records steam flow and thin liquor flow —*

3. *records liquid level in thin and strong liquor storage tanks —*

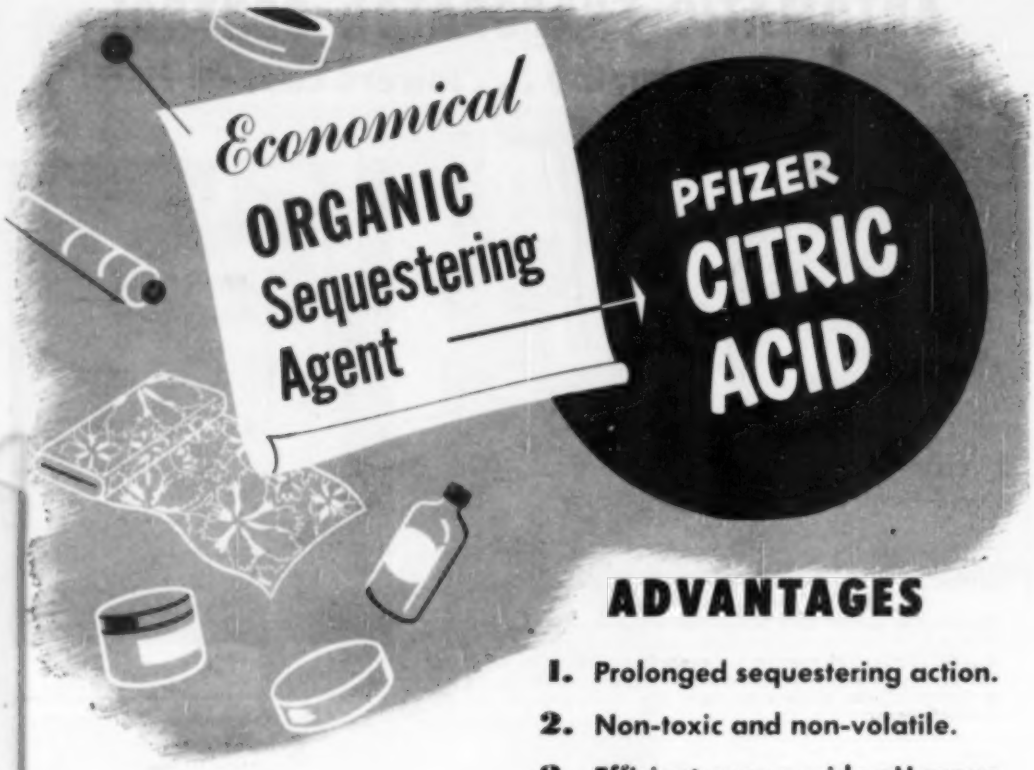
4. *records chemical contamination in steam condensate and condenser hot water leaving evaporator . . . and —*

5. *automatically diverts these to sewer if contamination rises above safe limits.*

FOXBORO

Reg. U. S. Pat. Off.

Process-Improving Controls
FOR THE TEXTILE INDUSTRY



ADVANTAGES

1. Prolonged sequestering action.
2. Non-toxic and non-volatile.
3. Efficient over a wide pH range.
4. Inexpensive.

• Pfizer Citric Acid is an economical organic sequestering agent widely applicable in the soap, textile, drug, cosmetic and other industries. It is economical to use because it is an inexpensive *organic* sequestering agent which provides long lasting sequestering action. This is especially desirable in the textile industry for dye baths.

Because Citric Acid is non-toxic it may find use in places where a sequestering agent is needed in cosmetics and pharmaceuticals. In these products the prolonged sequestering action of Citric Acid enhances the shelf-life of the products. Citric Acid provides efficient sequestering action for metallic ions including copper, iron, aluminum and calcium in a pH range of from 5 to 10.

Pfizer Citric Acid is available in the U.S.P. grade and as Anhydrous Citric Acid. For further information on the sequestering action of Citric Acid please write: Chas. Pfizer & Co., Inc., 630 Flushing Avenue, Brooklyn 6, N.Y.; 425 North Michigan Avenue, Chicago 11, Ill.; 605 Third Street, San Francisco 7, Calif.

PFIZER QUALITY

PFIZER

Manufacturing Chemists for Over 100 Years

Chemical Economics

RICHARD F. WARREN, Market Editor

Second Quarter Outlook Is Bright As Demand Remains High

Business prospects for most sections of the process industry look good at the start of the second quarter. Many branches expect to register substantial gains over last year's operating rates. Among the signs of optimism are a wide range of price increases for chemicals and other products of the process industries. High on the list are the price hikes in sulphuric acid, ethyl alcohol, isopropyl alcohol and several vegetable oils.

While the sulphuric acid price boost was not universal, it does indicate that some producers feel the outlook for their markets is good enough to pass on rising costs that have developed in the past year. Ethyl alcohol price rises mark the return of a more normal price situation in the solvent market. For more than a year solvent producers have been operating in a very deflated market and this month's price change shows that producers expect better business for the rest of the year. Molasses normal price level is considered to be at least 5 c. per gal. and on this basis fermentation alcohol should sell for 35 c. per gal. according to most industry executives. With refinery ethylene costing synthetic ethyl producers at least 2.5 c to 3.0 c., the delivered cost of synthetic ethyl comes close to the 35 c. per gal. level, allowing for a reasonable profit.

However, in spite of this upward movement, the long term price trend for a multitude of newer chemicals is down. Harry S. McClure, vice president of Carbide and Carbon Chemicals Corp., speaking before the Commercial Chemical Development Association, stated that the average price of 14 major aliphatic chemicals was 27 c. per lb. in 1939 and that in 1950 the average price for the group was 9 c. per lb. He also pointed out that the average time required to go from test tube to tank cars is still from six to seven years. As more multi-functional organics such as ethanolamine are developed, it is expected that a much greater number will grow to the stature of "tank car chemicals." The time may come when progressive chemical companies will get 50 percent of their profits from products that are less than ten years old.

Construction costs also affect new product development. In recent years the heavy demand for chemicals has kept building of new facilities at a high rate. Immediately after the war the question most often asked in construction was how soon can we get it? Now that materials are readily available the question has changed to how much will it cost? Prices have stabilized in recent months, but there are four pitfalls in completing new projects today within the expected cost limits. They are: (1) Appropriations based on incomplete estimates of the cost of the processing unit and a lack of appreciation of the contribution to final costs made by some of the less apparent cost items. (2) Estimates made before the processing studies have set up the required processing steps. (3) Lack of consideration for the requirements of non-process facilities and utilities. (4) Lack of control over the job as it progresses.

According to H. P. Broom of E. B. Badger, also speaking at the CCDA meeting, it is not always the best long-range policy to let minimum construction costs be the only consideration. In some cases a shorter completion time may be worth more than the money saved by months of specification writing and bid comparisons. With a proper balancing of these factors a closer control over building costs can be achieved and more accurate appraisal of the potential costs of new products can be obtained.

Consumption Trends

While final consumption data are not complete on first quarter operations, many producers report that business in the first quarter seems to be about 3-5 percent ahead of the operating rates reached in the first quarter of 1949. Chemical consumption in January ran ahead of the annual 1948 rate (the top year in chemical business). If the final returns live up to the first trickle of statistics on this period another record will be established. *Chemical Engineering*'s index of industrial chemical consumption reached 231 in January compared with an annual index number of 217 in 1949. This means that at the start of the year chemical consumption was about 8 percent above the past year's level of activities. All of which adds up to a good start for the chemical processing industries in 1950.

A month or two ago government economists were predicting good business in the first half of 1950—but a definite, though moderate drop in industrial production in the second half. Lately, they have been more hopeful. Here, in terms of Federal Reserve Board indexes, is how they expect industrial production to move this year:

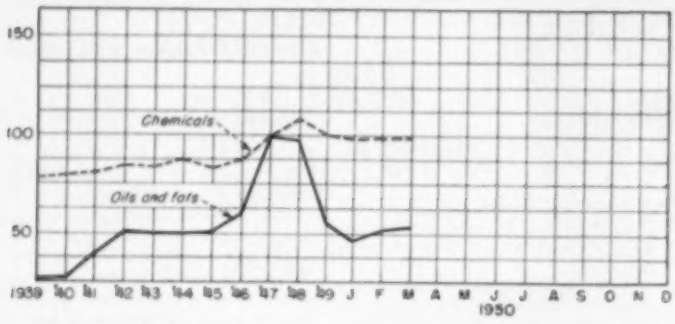
	March	June	Sept.	Dec.
Industrial production	181-5	182-5	175-80	173-5
Manufacturing	188-90	190-93	185-190	183-7
Durables	208-10	210-15	206-7	200-5
Non-durables	179-9	178-82	173-6	186-72

With more nylon capacity under construction at Seaford, Del., and Chattanooga, Tenn., and further expansion of raw materials facilities underway at Victoria, Tex., and Niagara Falls, N. Y., a considerable increase in output will take place in 1951—when these units come on stream. Last year 24 million pounds of nylon went into women's stockings. Uses for the balance of Du Pont's filament production is divided as follows: all other knitting 25 percent, broadweaving 49 percent, industrial and military uses 22 percent, and miscellaneous applications 4 percent.

Salt production data based on reports of producers representing a large percentage of the total evaporated and solar salt production in the United States is being reported monthly by Ernst & Ernst. According to their latest release, annual shipments of evaporated salt in 1949 were 2,089,936 tons. In addition, 489,267 tons of solar salt were shipped. According to the Bureau of Mines, evaporated and solar salt production amounted to 19.5 percent of total continental United States output in 1948.

PRICE, CONSUMPTION AND PRODUCTION TRENDS

PRICES

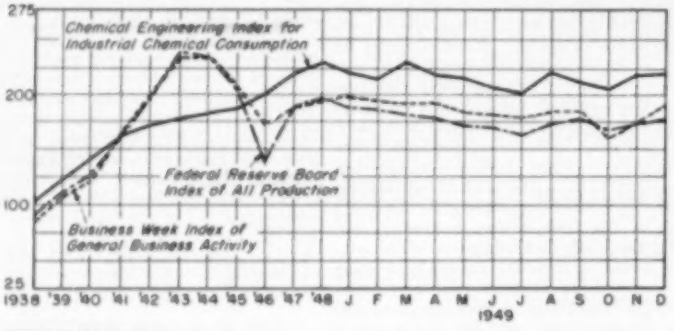


Chemical Engineering's Price Index
a month, a year, and two years ago

	Chemicals	Oils & Fats
As of April 1	99.92	55.72
Last month	99.04	53.57
April 1949	102.03	51.28
April 1948	108.98	97.95

1947 = 100

CONSUMPTION


275
200
100
25
Chemical Engineering Index for Industrial Chemical Consumption
Federal Reserve Board Index of All Production
Business Week Index of General Business Activity
1938 '39 '40 '41 '42 '43 '44 '45 '46 '47 '48 J F M A M J J A S O N D
1949

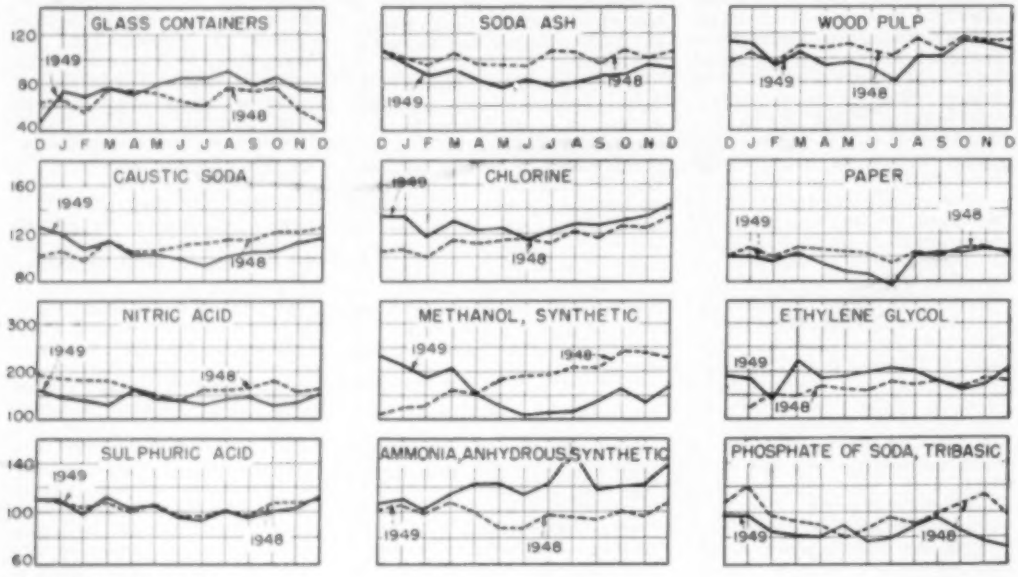
Chemical Engineering's Consumption Index for Industrial Chemicals

(A breakdown by consuming industries)

	December (Revised)	January
Fertilizers	50.49	48.01
Pulp and paper	22.62	25.80
Petroleum refining	21.90	22.15
Glass	16.80	18.62
Paint and varnish	15.96	21.05
Iron and steel	14.17	14.51
Rayon	29.25	29.70
Textiles	10.54	10.50
Coal products	10.62	10.19
Leather	3.83	3.85
Explosives	7.10	6.05
Rubber	4.87	5.40
Plastics	12.58	15.48
INDEX	219.73	231.41

1938 = 100

PRODUCTION



100=Monthly Average 1947

FOR CONDENSER TUBES

MOST plants operating a number of condensers, heat exchangers and similar equipment using condenser tubes find that tube life varies, a bundle in one condenser lasting longer than in another. This points up the fact that obtaining longer life hinges on detailed study of individual conditions, such as Revere is ready to make for you.

Take the case of a shell-type condenser following a high stage compressor. Admiralty tubes lasted about a year, red brass less, and treatment of the gas had produced no improvement. Failure was due to thinning at the cool end, and cracking at the hot end. Microphotographs taken in the Revere Laboratory showed transgranular corrosion-fatigue cracks originating from the base of the pits on the vapor side of the tube. Hence it was evident that failure was due to a combination of corrosion and vibration.

The remedies recommended were: redesign of inlets and baffles, reduction of vibration in adjoining machines, bracing of the condenser, and alkali treatment to raise the pH up to 7.5—8.5. The result: substantially increased service from inhibited Admiralty tubes.

Revere stands ready at all times to work with tube users in the endeavor to extend the period between re-tubings.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere

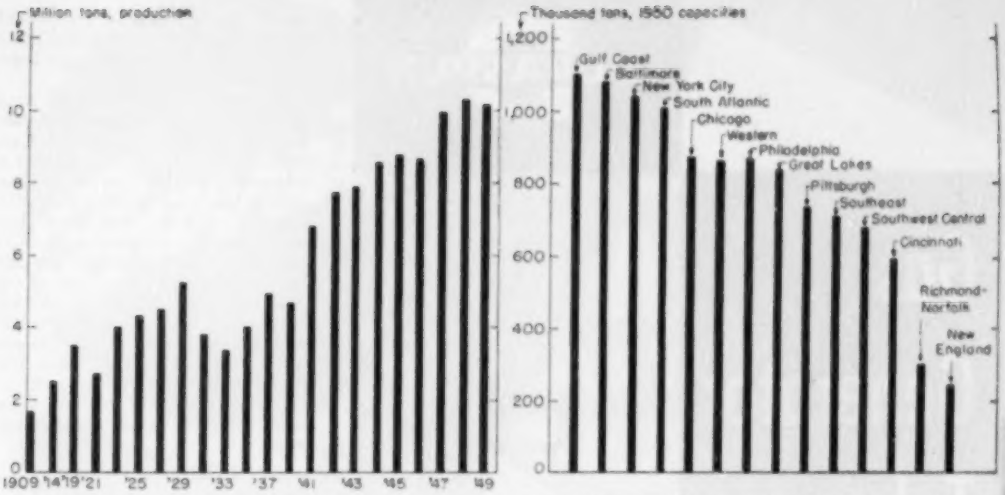
Metal & Thermit's ability to supply a widely diversified group of tin chemicals is a result of nearly fifty years of tin development and supply.

Don't lose sight of Sn! . . . in one form or another it may be the answer to your problem. And, M & T . . . the specialist in tin . . . offers technical service and advice in connection with any of its products.

We invite your inquiry. Literature is available—and we shall be pleased to discuss tin or tin chemicals with you at any time.

METAL & THERMIT CORPORATION
120 BROADWAY · NEW YORK 5, N. Y.

Specialists in Tin



PRODUCTION towers over all other chemicals.

CAPACITIES of acid makers in main consuming areas.

Commodity Survey:

SULPHURIC ACID

Here is the king of chemicals. It is the most important building block in the chemical process industries.

JOHN R. SKEEN, *Director of Market Research, Foster D. Snell Inc., New York, N. Y.*

There is little glamor about sulphuric acid—it is not part of bomber noses, parachutes or miracle drugs. But without sulphuric acid neither these nor most of the catalog of chemicals could exist. It is, indeed, the workhorse of the industry and there generally is more than enough for all needs. In time of war deficits appear. The present capacity of about 12 million short tons includes the expansion of 70 percent achieved during the last decade. Only recently has the supply become equal to the demand. If history repeats, there will be an excess in the near future.

FOR EVERY GRADE, A USE

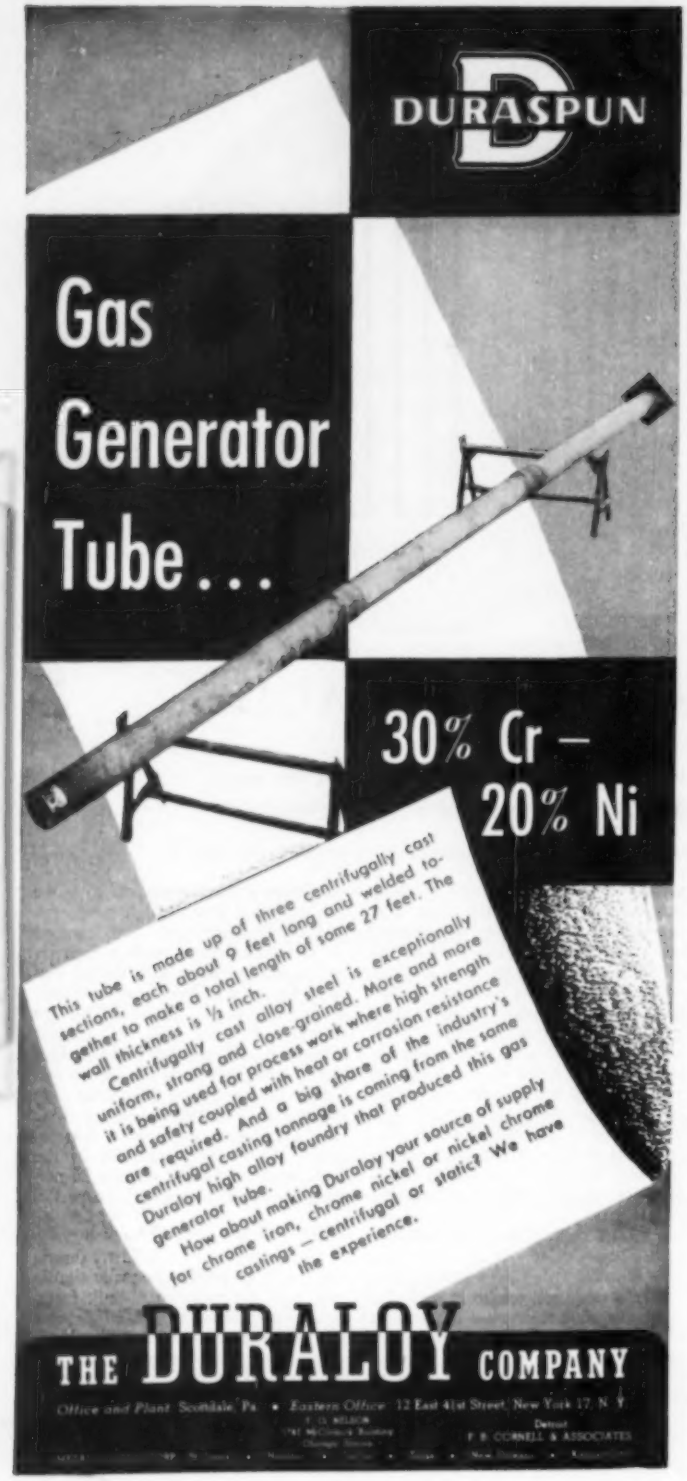
The dozen different grades have diverse markets. For instance, 53-58 Be. acid is mixed with ground phosphate rock converting it into soluble calcium phosphates, available as plant food. The 60 Be. grade is used to make the sulphates of ammonia, copper (bluestone), aluminum (alum), magnesium (epsom salts), zinc, iron (copperas), and others; the mineral acids; such organic acids as citric, oxalic, acetic and tartaric. This grade is used in pickling iron and steel before galvanizing and tinning; producing and refining heavy metals; preparing of sugar, starch and sirup; and in electroplating. The acids in the range of 93-98 percent are of value in purifying petroleum benzenes and oils; the preparation of titanium dioxide; alkylation of isobutane; the manufacture of many nitrogen chemicals; the synthesis of phenol; and the production of fatty acids. The fuming grades are needed to make TNT, nitrocellulose and nitroglycerine; in dye manufacture; and to fortify the weaker acids.

Ten years ago, sulphuric acid was among the first to respond to demands of war. From a "normal" production level of less than 5 million tons annually, the idle capacity was soon used to its limit of about 7 million tons. In 1941 and almost constantly thereafter, government made and revised plans for new installations. Ten ordnance plants and arsenals were equipped to make over a million tons of high concentration; the Defense Plant Corp. financed 15 new installations with a capacity of 1.2 million tons; and, during war years, the industry built nearly as much more in 30 plants. In addition, the recovery of spent acid was sharply stimulated. While it is probable that these accomplishments were nearly sufficient, transportation difficulties soon appeared—there were not enough tank cars to achieve uninterrupted distribution. Many units, especially in the East, were required to operate 20 percent or more in excess of rated capacity.

CAPACITIES ARE GROWING

The activities of the industry during the last three years are equally significant. Of the government-built facilities, three ordnance and all defense units with capacity of 1.6 million tons were sold to private producers. At least 16 new plants designed for nearly a million tons were built or building while equipment rated at a half million tons was added to five other opera-

(*Continued*)


DURASPUN
Gas Generator Tube...
30% Cr – 20% Ni
This tube is made up of three centrifugally cast sections, each about 9 feet long and welded together to make a total length of some 27 feet. The wall thickness is ½ inch.
Centrifugally cast alloy steel is exceptionally uniform, strong and close-grained. More and more it is being used for process work where high strength and safety coupled with heat or corrosion resistance are required. And a big share of the industry's centrifugal casting tonnage is coming from the same Duraloy high alloy foundry that produced this gas generator tube.
How about making Duraloy your source of supply for chrome iron, chrome nickel or nickel chrome castings — centrifugal or static? We have the experience.
THE DURALOY COMPANY
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Detroit
F. B. CORNELL & ASSOCIATES

tions. The net result is that present capacity is about 11.3 million tons with almost a half million more available for lease or purchase.

The recent market has been most profitable. Costs vary greatly depending upon plant location and type. Profits are determined also by what is done with the acid. One case, and an extreme one, may be cited in illustration. A sulphuric acid plant built three years ago consumed most of its output to make ammonium sulphate for fertilizer. The total cost at the site was less than $20 per ton and the salt was sold for nearly $40. The plant was completely amortized in one year. Others have approached this performance. Whatever happens in the future, few, indeed, will show losses from the investments already made.

HOW IT IS MADE

The older chamber process accounts for 32 percent of present production. Brimstone or pyrites is burned to sulphur dioxide which is conducted to a Glover tower and mixed with nitrogen oxides. Sulphur trioxide is formed and hydrated in lead-lined chambers where the product is collected as 50 Be. acid. The effluent gases are scrubbed by 60 Be. acid in Gay-Lussac towers and the resulting nitrous vitriol is pumped to the Glover tower. The chamber acid may be concentrated by heat to make oil of vitriol, 66 Be. Further fortification necessitates oleum or sulphur trioxide obtained from contact plants. The constant growth of the chemical industry elevated the contact process to its position of dominance. There are almost endless variations in the procedure. Brimstone is commonly melted and atomized in a burner where the conversion to dioxide occurs. The further oxidation is achieved catalytically by the action of finely divided platinum or vanadium supported on asbestos, silica gel, zeolite or kieselguhr. The gas is absorbed in strong acid and concentrations up to 65 percent free trioxide can be obtained.

These developments have taken over two centuries to accomplish. The first lead chamber in 1746 is credited to Dr. Roebuck of Birmingham, England. A mixture of brimstone and saltpeter was converted batchwise in a small unit.

Steam was introduced into the chambers nearly 30 years later and in 1793 air was admitted during the reaction. Shortly after, the continuous method for burning sulphur was introduced. The art of welding lead, invented by de Richemond in 1838, marked an advance in chamber con-

(Continued)

Barrett*

"ELASTEX" PLASTICIZERS

BARRETT "ELASTEX" DE[illegible] PLASTICIZER (Dicyclohexyl [illegible])

Color	White
Form	Granular solid
Odor	Mild, characteristic
Acidity (as Phthalic Acid), %	0.01 Maximum
Ester content, % by weight	99 Minimum
Melting Point, °C	62-65
Containers	Fibre drums containing approximately 250 pounds net.

BARRETT "ELASTEX" [illegible] PLASTICIZER (Diisooctyl [illegible])

Color	50 Hazen, Maximum
Form	Clear liquid
Odor	Mild, characteristic
Acidity (as Phthalic Acid), %	0.01 Maximum
Specific Gravity, 20/20°C	0.983 to 0.987
Saponification Number	280-290
Cloud test	Clear at 0°C
Containers	50-55 gal. non-returnable steel drums.

BARRETT "ELASTEX" 50-B PLASTICIZER

Color	80 Hazen, Maximum
Form	Clear liquid
Odor	Mild, characteristic
Distillation at 5 mm. Hg. (5-95%) °C	189-222
Specific Gravity, 20/20°C	1.075 to 1.081
Acidity (as Phthalic Acid), %	0.01 Maximum
Saponification Number	364-374
Containers	50-55 gal. non-returnable steel drums.

BARRETT "ELASTEX" 28-P PLASTICIZER (Dioctyl Phthalate)

Color	50 Hazen, Maximum
Form	Clear liquid
Odor	Mild, characteristic
Acidity (as Phthalic Acid), %	0.01 Maximum
Specific Gravity, 20/20°C	0.983 to 0.989
Ester Content, % by weight	99 Minimum
Cloud test	Clear at 0°C
Containers	50-55 gal. non-returnable steel drums

Barrett

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
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struction but the first significant technical development occurred twenty years later when John Glover erected his tower near Durham, England. The older Gay-Lussac tower then proved its value in the recovery of the nitrogen oxides and the Glover tower was the economic means of denitrating the discharged acid without dilution with water. These are essential features of the process; all else is refinement.

All elements of the contact process were disclosed by Perigrene Phillips in a British patent issued in 1831. It met with no success because of high costs and lack of demand for fuming acids. However, the advent of synthetic dyes created a market for concentrated acids free of impurities. Chamber acid would not do and the Nordhausen process beginning with ferric sulphate supplied what was needed. In 1875 Emil Jacobs in Germany operated the first commercially successful contact plant using chamber acid as the raw material. Six years later the Mann Chemical Works in Alsace employed sulphur as the starting material. However, not until early in this century was contact acid made in significant amount.

BACKGROUND

The industry began in the United States when John Harrison of Philadelphia produced a few carboys in 1793. This plant soon expanded to 200 tons annually and in 1917 was acquired by E. I. du Pont de Nemours & Co. The first significant market was created when Dr. P. S. Chappell of Baltimore patented the process for making superphosphate just 100 years ago. Together with William Davison, who later organized the Davison Chemical Co., the manufacture of superphosphate and mixed fertilizers began. Within 15 years 60 thousand tons of chamber acid were so consumed and plants sprang up all over the East. They employed pyrites, mostly imported from Spain. Early in the century legislation was enacted designed to eliminate sulphur dioxide fumes discharged from smelters. As a result, the New Jersey Zinc Co. and others began the production of by-product acid. The Tennessee Copper Co. followed. With a production of 200 thousand tons, this company operated the largest plant in the world by 1911. Shortly after, Pennsylvania Salt Mfg. Co. erected a plant in Philadelphia while General Chemical Co. built at Marcus Hook, Pa.

With the establishment of the chemical industry during World War I, a great demand for fuming acids

(*Continued*)

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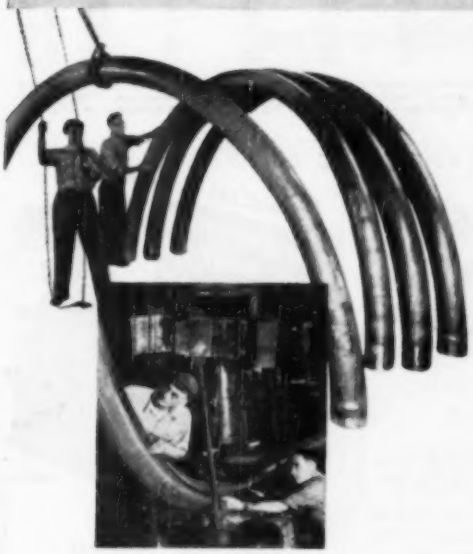
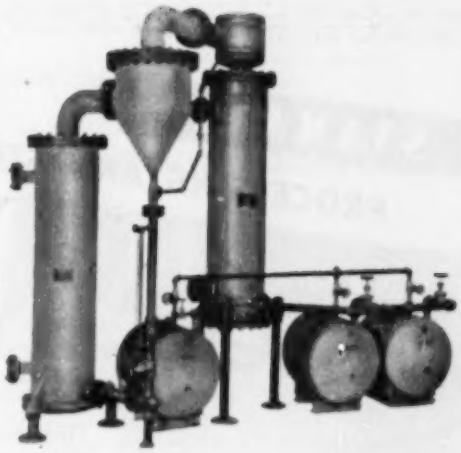


THEY GET "THE BENDS" – Bending large tube is an art. But success demands metal properly and uniformly annealed. This photo shows soft ANACONDA Copper Tubes 8 in. O.D. x .170 in. wall x 21 ft. 6 in. in the shop of Carl Bobke, Milwaukee, Wis. They were filled with resin and bent cold in a hydraulic press. The tubes are for assembly in a steam coil to heat wort beer. Joints were made by expanding ends of pipe sections, telescoping and brazing with silver solder.



"ALL-DAY SUCKER" – This equipment is a vacuum evaporator built by The Patterson-Kelley Company, East Stroudsburg, Pa., for concentrating syrup. The unit consists of an evaporator, cyclone separator, secondary separator, condenser, syrup receiver and two condenser receivers. All except the last are of welded Everdur* (ANACONDA Copper-Silicon Alloys). All piping except the condensate lines leading to receivers is also Everdur.

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appeared. Imports of pyrites nearly stopped and the industry turned to brimstone, readily available through the process of Herman Frasch. Of the 6 million tons capacity at the end of the war, 2.4 million was contact and half consumed sulphur. The rise of petroleum refining, rayon, cellulose film, and metal products spelled constantly expanding markets for sulphuric acid, especially contact concentrations. This trend continues. *(Continued)*

Capacity: Ordnance Plants[1]

Unit: 1,000 short tons of 100 percent acid

Location		Name of Plant	Capacity (Approximate)	Disposition[2]
Ala.	Sylacauga	Alabama Ordnance	146	1950: lease being concluded
Ill.	Joliet	Joliet Arsenal	73	1949: offered for lease
Kan.	Eudora	Sunflower Ordnance	43.6	1950: lease being concluded
Ky.	Paducah	Kentucky Ordnance	107	1949: available for purchase
Minn.	St. Paul	Gopher Ordnance	73	Equipment sold to Algonquin Chemical Co.
Pa.	Geneva	Keystone Ordnance	127.7	Equipment sold to General Chemical Co.
Tenn.	Chattanooga	Volunteer Ordnance	146	1949: offered for lease
Tenn.	Copper Hill	E. Tennessee Ordnance	240.1	Sold to Tennessee Corp.
Va.	Radford	Radford Arsenal	25.5	1949: offered for lease
Wis.	Merrimac	Badger Ordnance	73	1949: available for purchase
TOTAL		10	1,055.1	

[1] *Chemical Plants & Facilities*, p. 32; report of the Surplus Property Administration to the Congress Nov. 12, 1945; all contact plants. [2] From announcements subsequent to 1945.

Estimated Domestic Consumption[1]

Unit: 1,000 short tons of 100 percent acid

	Fertilizers	Petroleum Refining	Chemical Mfg.[2]	Coal Prods.	Metallurgy[3]	Paints & Pigments	Explosives[4]	Rayon & Film	Textile	Misc.	Total
1914[5]	1,560	330	———	———	235	———	143	———	———	229	2,517
1918	1,324	417	460	———	617	65	1,686	———	62	45	4,670
1929[5]	1,504	976	594	582	917	140	121	93	56	243	5,186
1932	485	771	419	236	261	90	75	110	47	143	2,743
1933	1,070	609	585	389	715	249	109	188	56	213	4,182
1936	1,237	684	613	479	808	280	139	205	67	236	4,747
1937	1,387	684	655	538	1,073	327	113	237	70	278	5,341
1938	1,162	684	498	364	585	267	87	199	36	221	4,143
1939	1,225	753	607	460	904	323	160	252	72	239	4,995
1940	1,406	784	696	560	1,144	361	106	292	78	286	5,713
1941	1,555	871	1,113	585	1,400	436	118	346	103	342	6,867
1942	1,835	900	2,145	605	980	475	130	390	90	350	7,780
1943	2,500	940	2,285	580	895	495	115	415	85	350	8,650
1944	2,640	1,020	2,480	605	910	510	120	450	75	350	9,160
1945	2,850	1,020	2,220	600	910	520	100	495	70	400	9,175
1946	3,020	1,000	1,700	510	755	550	105	555	75	320	8,651
1947	3,410	1,180	2,010	698	935	665	125	610	73	389	9,930
1948	3,490	1,220	2,100	670	985	690	130	640	70	370	10,235
1949	3,470	1,210	2,080	630	845	670	123	650	75	377	10,100

[1] All data from *Chemical & Metallurgical Engineering*, reported annually as 50 Be. acid and converted here to 100 percent equivalent. [2] 1941–47: includes acid consumed in direct defense, such as for military explosives. [3] The original categories "Iron & Steel" and "Other Metallurgical" are combined. [4] Before 1941 almost entirely industrial; 1941 and after presumably entirely industrial. [5] See also U.S. Bureau of Mines *Bulletin No. 184*, 1920. [6] *Chemical & Metallurgical Engineering*, Nov. 1945, p. 111.

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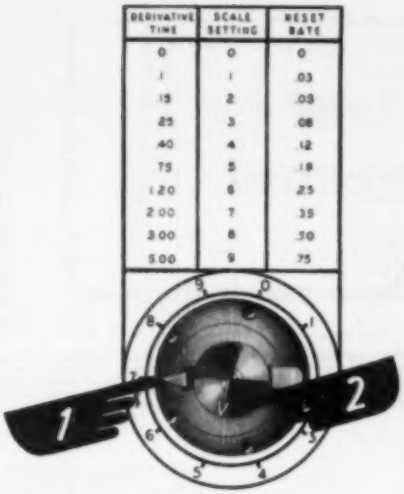

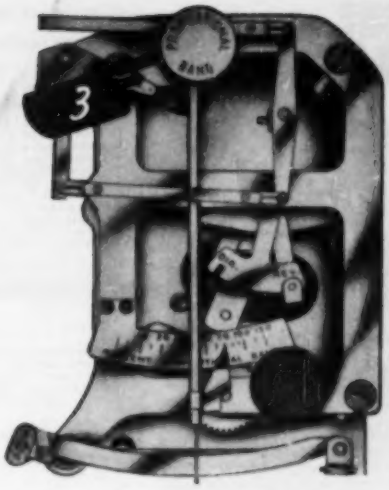

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Capacity: Leading Producers, 1950

Unit: 1,000 short tons of 100 percent acid

Producers	Plants (Number)	Capacity[1] Total	Chamber	Contact
General Chemical Div.[2]	15	1,490	10	1,480
E. I. du Pont de Nemours & Co.	21	1,200	640	560
Southern Acid & Sulphur Co.[3]	5	620	0	620
Tennessee Corp.	5	610	280	330
Standard Wholesale Phosphate & Acid Co.[4,5]	2	585	170	415
American Agricultural & Chemical Co.	17	550	550	0
Consolidated Chemical Industries (Stauffer)	3	480	0	480
National Lead Co.	2	410[6]	0	410
American Cyanamid Co.	6	360	35	325
Virginia-Carolina Chemical Co.	10	360	280	80
Monsanto Chemical Co.	2	340	0[7]	340
Armour & Co.	13	310	310	0
Davison Chemical Co.	2	260	100	160
Stauffer Chemical Co.	3	200	0	200
American Smelting & Refining Co.	4	255	0	255
SUB-TOTAL	121	8,080	2,355	5,735
Other	88	3,355	1,295	2,060
TOTAL	209	11,445	3,650	7,795

[1] Approximate only and including plants reported early 1950. [2] Assets transferred to Mathieson Chemical Corp. 1948–49. [3] Capacity reported in excess of 700 M tons per year including the largest single unit in the world. [4] Highly uncertain because of doubtful disposition of over 500 M tons of contact capacity purchased from Defense Plants (6) — most, perhaps all, used for replacements. [5] Also reported that 60 M tons capacity is chamber at E. St. Louis. [6] Reported limits are 364–453 M tons.

Capacity: Distribution by Area, 1950[1]

Unit: 1,000 short tons of 100 percent acid

Economic area[2]	Plants (number)[3] Chamber	Contact	Capacity[4] Total	Chamber	Contact
New England	3	3	250	45	205
New York City	4	6	1,045	260	785
Philadelphia	4	9	965	360	605
Baltimore	7	3	1,090	490	600
Richmond-Norfolk	5	4	300	70	230
South Atlantic	38	5	1,005	790	215
Southeast	12	4	705	405	300
Cincinnati	5	6	495	160	335
Pittsburgh	3	9	775	275	500
Great Lakes	10	10	840	305	535
Chicago	6	11	675	225	450
St. Louis	2	5	600	105	495
Southwest Central	1	8	680	10	670
Gulf Coast	3	9	1,100	60	1,040
Western	2	17	870	140	730
SUB TOTAL	103	106	11,443	3,650	7,795
Other (see Table 5)	0	7	614	0	614
TOTAL	103	113	12,059	3,650	8,409

[1] Values in this and other tables relating to capacity are unofficial and approximate except in a few cases; data are based upon surveys made in 1943 and 1948, capacity information as published, and opinions expressed by Government experts, representatives of two producers for fertilizer use and three industrial producers. [2] This grouping follows that given in *Facts for Industry*, Series M19.1-08, *Sulphuric Acid*. [3] Believed nearly complete for operating plants. [4] An attempt made on the basis of "rated capacity" for prime acid only; includes two new plants due 1950: American Smelting & Refining Co. plant at Tacoma, Wash. and the American Cyanamid plant at Hamilton Ohio; excludes the plant of Virginia-Carolina Chemical Co. at Wadesboro, N. C., dismantled 1949, excludes new Monsanto capacity in New England.

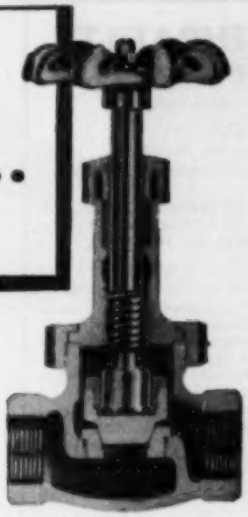
Capacity: Privately Financed, 1942-45[1]

Unit: 1,000 short tons of 100 percent acid

Location		Operator	Capacity[2] (Approximate) New	Total	Raw Materials
Ala.	Troy	Standard Chemical Co.	18	18[3]	S
Cal.	Dominguez	Dominguez Chemical Co.	36.5	73	H2S, S
Cal.	Port Chicago	General Chemical Div.	15	117	Pyrites
Cal.	Los Angeles	Stauffer Chemical Co.	21.6	21.6	S, pyrites
Conn.	Naugatuck	Naugatuck Chemical Div.	2.5	6	S
Fla.	E. Tampa	Tennessee Corp.	77.7	172.3[3]	S
Fla.	Bartow	Armour & Co.	36	36[3]	S
Ga.	Savannah	American Ag. Ch. Co.	10	45.8	S
Ill.	Chicago Hts.	Swift & Co.	36	36	S
Ill.	Joliet	Hooker Chemical Co.	20.8	43	S
Ill.	Monsanto	Monsanto Chemical Co.	72	132	S, pyrites, sludge
Ind.	E. Chicago	E. I. du Pont de Nemours & Co.	16	24	S, pyrites, Zn ore, etc.
Ky.	Wurtland	E. I. du Pont de Nemours & Co.	45	81	S
La.	Bossier City	Southern Acid & Sulphur Co.	36.5	73	S
La.	Baton Rouge	Consolidated Chemical Industries	72	144	S
Mo.	Seaport	Sunnyers Fertilizer Co.	25.2	25.2	S
Md.	Baltimore	Standard Wholesale, Phosphate & Acid Co.	109.6	379.6[3]	S
Mass.	Everett	Monsanto Chemical Co.	41	177	S
Mo.	St. Louis	National Lead Co.	70	163	S, Zn ore
N. J.	Deepwater Pt.	E. I. du Pont de Nemours & Co.	7.6	73.6	S
N. J.	Grasselli	E. I. du Pont de Nemours & Co.	2.4	147	S
N. J.	Sayreville	National Lead Co.	100	232.6	S, pyrites
N. C.	Wilmington	Virginia-Carolina Chemical Co.	25.2	25.2	S
Ohio	Cleveland	E. I. du Pont de Nemours & Co.	40	40	S, Zn ore
Ohio	Cincinnati	Virginia-Carolina Chemical Corp.	14.6	14.6	S
Ohio	Summit	Minnesota Mining & Mfg. Co.	18.2	42.2	S
Pa.	Marcus Hook[4]	General Chemical Div.	100	200	Pyrites
Tex.	Fort Worth	Consolidated Chemical Ind.	12	36	S, sludge
Tex.	Houston	Consolidated Chemical Ind.	32	96	S, sludge
Utah	Garfield	Garfield Chemical Mfg. Corp.	36.5	36.5	Copper ore
Va.	Piney River	American Cyanamid Co.	14	32.4	S
Wis.	Barksdale	E. I. du Pont de Nemours & Co.	5.3	33.6	S
TOTAL			1,174	2,814	

[1] Believed to be a complete list as developed from announcements and reviewed by several in government and industry. [2] New capacity as understood to have been installed together with approximations of total capacity then resulting; not official data — simply crude opinion or data contributed by the operators. [3] Chamber plant. [4] 45 M tons believed to be contact; the rest chamber. [5] An approximate total of which about 108 M tons is chamber. [6] Two in the plan, always reported as being at Claymont, Nr. Claymont or New Castle for obscure reasons. [7] Reported that one plant is to be dismantled and a new capacity of 120 M tons will be installed in 1951.

Walworth bronze valves...



Walworth No. 225P Globe Valve
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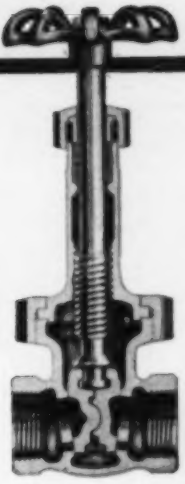

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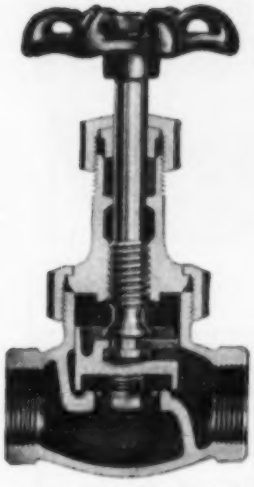

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Walworth No. 29 Bronze Gate Valves are rated at 200 psi working steam pressure, 550F; 400 psi cold water, oil and gas. These valves have rising stems and integral seats. Sizes 2-inch and smaller have union bonnets; sizes 2½ and 3-inch have bolted bonnets. Valves up to and including 2½-inch have solid wedge discs; 1-inch and larger have split wedge discs. These valves can be repacked under pressure when fully opened.

Walworth No. 225P Bronze Globe Valves (Angle Type: No. 227P) are rated at 350 psi working steam pressure, 550F; and 1000 psi non-shock service on cold water, oil and gas. The stainless steel, plug type seat and disc — heat treated to 500 Brinell — can be closed on sand, slag, scale and similar floatage, without injury to the seating surfaces. They are the longest wearing, TOUGHEST bronze valves you can buy.

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Commodity Survey, cont . . .

Capacity: Financed by Defense Plant Corp.[1]

Unit: 1,000 short tons of 100 percent acid

Location		Operator, Postwar	Capacity[2] (Approximate)	Raw Materials
Calif.	El Segundo	General Chemical Div.	65	H_2S, S, Sludge
Calif.	Richmond	General Chemical Div.	65	Pyrites, sludge
Col.	Denver	General Chemical Div.	25	Pyrites
Ill.	E. St. Louis	General Chemical Div.	48	S
Ill.	Chicago	General Chemical Div.	82.5	Pyrites
Ind.	Hammond	Stauffer Chemical Co.	72	S
Md.	Baltimore	Davison Chemical Co.	90	S, pyrites
Mich.	Detroit	General Chemical Div.	67	Pyrites
N. Y.	Buffalo	General Chemical Div.	100	S, pyrites
Ohio	Cleveland	General Chemical Div.	70	S
Okla.	Tulsa	Ozark Chemical Co.	116.8	S
Pa.	Cornwell Heights	Cornwell Chemical Co.	27	S
Pa.	Newell	General Chemical Div.	150	Pyrites
Tex.	Beaumont	Southern Acid & Sulphur Co.	31.5	S
Va.	Front Royal	General Chemical Div.	170	S
TOTAL	15		1,179.8	

[1] Capacities are approximate and in terms of new acid; while this list is believed to be complete, there are several uncertainties; all contact plants. [2] All said to have been purchased by operators except the Denver plant, not known to be operating; excepting for the California & Front Royal plants, the facilities purchased by General Chemical Division, Allied Chemical Dye Corp., were intended to be dismantled, transported to other sites and for the most part used for repairs.

Production, Plants & Price

Unit: 1,000 short tons of 100 percent acid

	Production[1]					Number of Plants[2]		Price[3]
	Total (Gross)	New Acid			Spent Acid (Certified)			$ per ton 66 Be.
		Sub-total	Contact	Chamber		Chamber	Contact	
1914	———	2,817	———	———	———	———	———	7.00
1919	———	3,784	———	———	———	———	———	37.75
1918	———	3,910	———	———	———	196	50	30.16
1921	———	2,717.2	2,031.4	685.8	———	———	———	18.25
1935	———	3,909.6	2,133.7	1,865.9	———	101	65	15.50
1937	———	4,941.4	2,364.7	2,576.6	———	98	70	16.04
1939	———	4,795.1	2,674.1	2,121.0	———	95	70	16.50
1941	———	6,770.1	3,758.2	3,011.9	———	———	———	16.50
1942	———	7,754.0	4,839.3	2,914.7	———	———	———	16.50
1943	9,442.1	7,870.8	4,703.2	3,147.6	591.4	101	84	16.50
1944	9,242.2	8,539.4	5,302.2	3,237.2	702.8	102	90	16.50
1945	9,522.1	8,687.1	5,517.9	3,169.2	835.1	101	88	16.50
1946	9,203.0	8,658.6	5,653.9	3,004.7	544.4	97	85	16.50
1947	10,574.9	9,956.6	6,632.7	3,325.9	616.3	95	82	16.47
1948	10,950.1	10,231.1	7,269.7	2,961.3	719.0	———	———	15.50
1949 1Q	2,811.3	2,640.3	1,918.4	921.9	171.0	———	———	17.00
2Q	2,705.2	2,523.0	1,876.6	646.4	182.2	———	———	17.00
3Q	2,545.5	2,398.4	1,766.9	621.5	137.0	103	106[4]	17.00
4Q	2,822.9	2,628.2	1,949.4	678.8	194.7	———	———	———

[1] Including acid production by Ordnance; 1914–21: *Census of Manufactures*, also *Bulletin No. 184*, Bureau of Mines; 1935–39: *Census of Manufactures*; 1941–45: *Facts for Industry*, series M19A-supplement, Jan. 31, 1947; 1946–: *Facts for Industry*, series M19A, monthly. [2] 1918: *Bulletin No. 184*, loc. cit.; 1935–39, and 1947: *Census of Manufactures*; 1943–46: *Facts for Industry*, series *6–1–1, 6–1–1 supplement 2, M19A-supplement*; 1949: Estimated. [3] Excluding Ordnance plants offered for lease, available for purchase and standby — totaling seven. [4] 1914–18: *Economics of Sulphuric Acid Industry*, Kreps; 1921: *Oil, Paint and Drug Reporter*; 1935–: Bureau of Labor Statistics; all late values tanks, fob. works. [5] Includes two contact plants expected in 1950.

Capacity: Installed 1946-49[1]

Unit: 1,000 short tons of 100 percent acid

Location		Operator	Capacity (Approximate) New	Total	Raw Materials
Ark.	El Dorado	Lion Oil Co.	109.5	109.5	S
Ark.	No. Little Rock	Southern Acid & Sulphur	182	182	S
Fla.	Jacksonville	Wilson & Toomer Fert.	30	37.5[2]	S
Ind.	Indianapolis	Marion Mfg. Co.	50	50	———
Ia.	Dubuque	Algonquin Chemical Co.	73	73	———
Ky.	Calvert City	Pennsylvania Salt Mfg. Co.	43	43	———
La.	Bossier City	Southern Acid & Sulphur	55	108	S
La.	Baton Rouge	Consolidated Chemical Corp.	56	200	S
Md.	Baltimore	Standard Wholesale, Phosphate & Acid Co.	205	585[3]	S
Md.	Hagerstown	Central Chemical Corp.	25	25	S
Mo.	St. Louis	Geo. S. Meghan Corp.	6	6	
Mont.	Anaconda	Anaconda Copper Mining Co.	54.7	87[3]	pyrites
N. J.	Kearny	Koppers Co.	21.6	21.6	S, H_2S
Ohio	Cincinnati	American Agricultural Chemical Co.	18	18	
Ohio	Hamilton	American Cyanamid Co.	40	40[3]	S
Ohio	Lockland	Internat'l. Minerals & Chemical Corp.	45	45	S
S. C.	Charleston	American Agricultural Chemical Co.	———	20[3]	S
S. C.	Charleston	A. F. Pringle & Co.	20	20[3]	S
S. C.	Spartanburg	Internat'l. Minerals & Chemical Corp.	20	20[3]	S
S. C.	Charleston	Naco Fertilizer Co.	43.8	43.8	S
Tex.	Port Arthur	Southern Acid & Sulphur Co.	———	75	S
Tex.	Pasadena	Southern Acid & Sulphur Co.	73	180	S, sludge
Tex.	Houston	Consolidated Chemical Industries	145	242	S, sludge
Tex.	Corpus Christi	American Smelting & Refining Co.	109.5	109.5	Zn ore
Tex.	(West Texas)	Sid Richardson	(small)	(small)[4]	H_2S
Va.	Richmond	E. I. du Pont de Nemours & Co.	109.5	109.5	S
Va.	Norfolk	Swift & Co.	36	36[3]	S
Wash.	Tacoma	E. I. du Pont de Nemours & Co.	12.8	12.8	S
Wash.	Tacoma	American Smelting & Refining Co.	36.5	36.5[5]	Ore
Wis.	Madison	Royster Guano Co.	26	26	———
W. Va.	Nitro	General Chemical Co.	110	110	S
TOTAL			1,720	2,041	

[1] Believed to be a complete list as developed from announcements and confirmed in most part by government experts and several producers; all contact plants unless otherwise specified. [2] Chamber plant. [3] Equipment obtained from Gopher Ordnance. [4] Reported as great as 720 M tons; about 168 M tons is chamber. [5] Unconfirmed. [6] Capacity announced for 1950. [7] Type of plant unconfirmed.

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United States Production of Certain Chemicals

Chemical (Tons unless otherwise noted)	December 1949	December 1948	November 1949	November 1948
Ammonia, synthetic, anhydrous[1]	124,900	99,303	115,467	93,794
Ammonium nitrate	90,380	80,486	76,716	79,222
Ammonium sulphate, synthetic (M lb.)	180,352	83,226	157,171	46,147
Calcium arsenate (M lb.)	1,646	.....	1,131	.....
Calcium carbide, commercial	58,806	57,971	56,212	55,347
Carbon dioxide:				
Liquid and gas (M lb.)	19,791	18,730	19,115	15,215
Solid (M lb.)	46,070	47,914	47,144	45,519
Chlorine	166,812	154,469	155,943	147,451
Chrome green (M lb.)	1,262	1,080	1,280	990
Chrome yellow and orange, (C.P.) (M lb.)	3,610	4,701	2,712	3,966
Hydrochloric acid	43,545	39,227	44,088	38,590
Hydrogen (M cu. ft.)	3,436,000	2,578,000	2,972,000	2,507,000
Lead arsenate, acid and basic (M lb.)	880	1,043	676	.....
Molybdate chrome orange, (C.P.) (M lb.)	660	842	845	800
Nitric acid	99,926	95,099	91,852	91,548
Oxygen (M cu. ft.)	1,306,000	1,400,000	980,000	1,246,000
Phosphoric acid (50 percent H_3PO_4)	114,671	100,149	118,217	104,137
Soda ash:				
Ammonia-soda process:				
Total wet and dry[2]	384,412	400,098	360,971	398,188
Finished light[3]	198,326	216,705	191,231	211,650
Finished dense	134,466	130,239	119,360	135,252
Natural[4]	14,826	22,681	17,413	19,196
Sodium bicarbonate, refined	14,474	13,510	13,054	11,972
Sodium bichromate and chromate	6,736	6,236	6,791	6,277
Sodium hydroxide:				
Electrolytic process:				
Liquid[5]	153,805	154,923	145,867	146,779
Solid	22,680	27,387	19,083	26,172
Lime-soda process:				
Liquid[5]	47,139	46,856	39,678	45,716
Solid	11,881	24,011	10,730	23,216
Sodium phosphate:				
Monobasic	1,388	1,230	1,247	1,187
Dibasic	11,943	8,963	12,796	8,796
Tribasic	8,000	6,932	8,788	7,886
Meta	2,688	2,977	2,847	3,857
Tetra	7,444	5,060	7,133	5,925
Sodium silicate, anhydrous	41,794	38,049	46,073	40,988
Sodium sulphate:				
Anhydrous	14,334	15,797	13,161	14,638
Glauber's salt[6]	15,614	13,004	15,980	15,427
Salt cake[6]	39,725	58,904	43,022	56,204
Sulphuric acid[7]:				
Chamber process	244,058	249,440	221,261	255,277
Contact process, new	691,917	670,526	644,805	630,417

Data for this tabulation have been taken from "Facts for Industry" series issued by Bureau of the Census. Production figures represent primary production and do not include purchased or transferred materials. Quantities produced by government-owned arsenals, ordnance works, and certain plants operated for the government by private industry are not included. Chemicals manufactured by TVA, however, are included. All tons are 2,000 lb. Where no figures are given data are either confidential or not yet available. [1]Includes a small amount of aqua ammonia. [2]Total wet and dry production, including quantities diverted for manufacture of caustic soda and sodium bicarbonate, and quantities processed to finished light and finished dense. [3]Not including quantities converted to finished dense. [4]Data collected in cooperation with the Bureau of Mines. [5]Figures represent total production of liquid materials, including quantities evaporated to solid caustic and reported as such. [6]Includes oleum grades, excludes spent acid. [7]Data for sulphuric acid manufactured as a byproduct of smelting operations are included.

United States Production of Synthetic Organic Chemicals

	December 1949	December 1948	November 1949	November 1948
Acetanilid	476,708	.....	285,908	.....
Acetic acid:				
Synthetic[1]	39,190,273	41,944,782	38,633,096	38,992,372
Recovered	109,736,445	135,382,908	149,153,300	136,280,862
Natural[2]	1,633,579	2,151,610	1,299,634	2,246,074
Acetic anhydride	73,458,417	67,940,785	79,852,554	73,450,150
Acetone	42,705,226	47,328,054	37,562,388	44,430,402
Acetylsalicylic acid	675,009	1,112,749	842,798	1,087,934
Aniline	7,024,439	5,847,086	7,282,657	6,212,145
Barbituric acid derivatives:				
5-Ethyl-5-phenylbarbituric acid and salts (phenobarbital)[3]	32,200	41,901	29,183	33,506

(*Continued on page 350*)

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The loading plant consists of two parallel storage bins spaced far enough apart to allow room for railroad tracks, tracks for the hoppers and cranes, and an endless conveyor belt. The belt along the center line between the bins is straddled by four cranes and their movable hoppers.

The cranes pick up the sulphur from the bins or cars and discharge into the hoppers, which automatically feed the belt. It is weighed while on this moving belt. After weighing it is discharged onto a smaller belt which in turn discharges through a cylindrical telescopic spout directly into the vessel's hold.

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75 East 45th St. New York 17, N. Y. INC.
Mines: Newgulf and Moss Bluff, Texas

U. S. Production of Synthetic Organic Chemicals, cont. from page 348

	December 1949	December 1948	November 1949	November 1948
Benzene:				
Motor grade:				
Tar distillers	292,323		294,366	
Coke oven operators	790,371	612,787	589,916	605,714
All other grades:				
Tar distillers	1,015,474	1,031,413	1,080,373	990,404
Coke oven operators	13,196,677	14,251,225	6,734,319	13,425,626
Butyl alcohol, primary, normal	9,366,981	14,021,644	12,076,991	15,066,945
Carbon bisulphide	35,609,505	27,567,527	24,547,142	25,982,231
Carbon tetrachloride	19,179,705	20,343,205	17,156,683	18,994,730
Chlorobenzene, mono	29,396,319	30,066,266	24,197,025	25,329,446
Cresote oil:				
Tar distillers	7,784,235	10,084,353	5,202,998	11,004,241
Coke oven operators	2,530,184	2,506,563	983,099	2,431,780
Cresols, meta-para	668,731	851,764	568,433	793,394
Cresols, ortho-meta-para	800,183	647,728	602,336	721,781
Cresylic acid, refined	2,828,821	2,169,469	1,982,670	2,060,511
Dibutyl phthalate	1,681,881	884,003	1,132,767	1,344,367
Dichlorodiphenyltrichloroethane (DDT)	3,673,986	3,199,089	1,818,089	3,670,478
Ethyl acetate (85 percent)	6,455,925	8,278,976	6,468,686	4,906,018
Ethylene glycol	38,080,197	34,869,720	28,359,123	31,972,983
Ethyl ether	2,264,168	2,295,330	2,832,900	3,178,905
Formaldehyde, 37 percent by wt.	58,437,882	49,823,166	51,866,227	50,089,966
Hexachlorocyclohexane	1,830,066	1,074,230	1,980,169	1,127,306
Methanol, natural	1,134,504	1,200,408	1,067,878	1,271,540
Methanol, synthetic	70,569,541	105,909,233	64,998,646	99,472,657
Naphthalene:				
Tar di tillers, less than 79° C.	16,782,414	16,953,781	16,565,084	16,528,666
Tar distillers, 79° C. and over	6,539,630	7,022,306	6,794,164	6,571,444
Coke-oven operators, less than 79° C.	7,318,967	9,646,634	5,486,430	9,306,245
Penicillin and salts	13,980,315	9,370,296	14,031,891	8,141,914
Phenol	22,570,456	27,911,627	20,307,173	25,603,728
Phthalic anhydride	18,674,562	15,872,987	16,339,944	15,220,745
Styrene, government and private plant	32,533,864	33,422,297	33,956,532	32,980,089
Toluene:				
Coke-oven operators	2,772,286	2,875,480	1,454,846	2,475,516
All other	3,552,859	3,861,008	3,102,081	3,879,581
Xylene, crude	4,295,206	5,755,126	4,223,808	6,618,445

All data in pounds except benzene (gal.), creosote oil (gal.), toluene (gal.), xylene (gal.) and penicillin (million Oxford units). Statistics collected and compiled by U. S. Tariff Commission except where noted. Absence of data on production indicates either that returns were unavailable or confidential. [1]Excludes the statistics on recovered acid. [2]Acid produced by direct process from wood and from calcium acetate. [3]All acetic anhydride including that from acetic by vapor-phase process. [4]Product of distillers who use purchased coal tar only or from oil-gas or water-gas produced or purchased by tar distillers. [5]Statistics are given in terms of bulk medicinals only. [6]Statistics collected by Bureau of Mines. [7]Total production including data reported both by coke-oven operators and by distillers of purchased coal tar. [8]Reported to U. S. Bureau of the Census. [9]Includes toluene produced from petroleum by any process. [10]Includes refined cresylic acid from petroleum.

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NEW CONSTRUCTION

	Current Projects		Cumulative 1949	
	Proposed Work	Contracts	Proposed Work	Contracts
New England			$2,000,000	
Middle Atlantic	$138,000	$1,600,000	128,000	$3,795,000
South	24,850,000	1,078,000	28,118,000	2,025,000
Middle West	1,893,000	1,800,000	4,338,000	15,720,000
West of Mississippi	6,100,000	2,408,000	62,475,000	25,087,000
Far West			15,236,000	2,979,000
Canada	200,000	10,050,000	12,820,000	21,347,000
Total	$33,181,000	$16,936,000	$125,125,000	$69,603,000

Proposed Work

Ind., LaPorte—American Rubber Products Co., LaPorte, is having plans prepared by Boyd Phelps, 1000 Washington St., Michigan City, for the construction of a 2 story, 70x132 ft. factory at 315 Brighton St. Estimated cost $175,000.

Ky., Louisville—Buckeye Cotton Oil Co., South Floyd St., plans to construct reinforced concrete soy bean storage silos. Estimated cost $250,000.

Mich., South Haven—Aurora Gasoline Co., 15911 Wyoming Ave., for a 12½ million gal. marine gasoline storage terminal.

Mich., Wyandotte—Wyandotte Chemical Co., Wyandotte, plans to construct a 3 story, T-shaped, 170x320 ft. research laboratory. H. F. Stanton, Free Press Bldg., Detroit, Archt. Estimated cost $1,500,000.

Neb., Beatrice—Northern Natural Gas Co., Aquila Court Bldg., Omaha, plans to construct a new plant. Estimated cost $1,600,000. M. C. Madsen, c/o owner, Engr.

N. Y., Niagara Falls—E. I. du Pont de Nemours & Co., Inc., du Pont Bldg., Wilmington 98, Del., plans to double the facilities of its plant here for the production of adiponitrile.

N. C., Pisgah Forest—Olin Industries, Inc., East Alton, Ill., plans to construct a cellophane manufacturing plant. Estimated cost between $18,000,000 and $20,000,000.

N. C., Wilmington — Mexican Petroleum Corp., Forrest G. Heath, Mgr., Insurance Bldg., Raleigh, plans to construct an oil refinery to include an asphalt plant to have a capacity of 100,000 tons a year. Estimated cost $3,500,000.

Pa., Philadelphia—Rohm & Haas Co., 5000 Richmond St., plans alterations to its storage and process buildings. Estimated cost $70,000.

Tenn., Lowland—American Enka Corp., 206 Madison Ave., New York, N. Y., plans to construct an addition to its plant here, also install new equipment. Estimated cost $2,000,000.

Tex., Altair—Superior Oil Co., Oil & Gas Bldg., Houston, plans to construct a gasoline plant. Estimated cost $1,500,000.

Tex., Etter—Phillips Chemical Co., Etter, plans to enlarge its chemical plant to have a capacity of 100,000 tons annually. Estimated cost $3,000,000.

W. Va., Clarksburg—Eagle Convex Glass Co., 423 Tuna St., is having plans prepared by Frank McEntee, 504 Baltimore Ave., for a 2 story factory. Estimated cost $100,000.

Wis., Neenah—Bergstrom Paper Co., 225 West Wisconsin Ave., plans to construct a waste treatment plant. Estimated cost $150,000.

Que., Shawinigan Falls—Consolidated Paper Co., Ltd., Sun Life Bldg., Montreal, plans to construct an addition to its plant. Estimated cost $200,000.

Contracts Awarded

Ga., Atlanta—Arkansas Fuel Oil Co., c/o Wesley & Co., contractors, 285 Hunnicutt St., N. W., will construct a warehouse. Estimated cost $75,000.

Fla., Tampa—Clorox Chemical Co., c/o William P. Neil Co., Ltd., contractor, 4814 Loma Vista St., Los Angeles, Calif., will construct a manufacturing plant. Estimated cost $180,000.

Ga., Cornelia—Chicopee Mfg. Corp., Cornelia, has awarded the contract for a laminite plant addition to A. K. Adams, 542 Plum St., N. W., Atlanta, Ga. Estimated cost will exceed $68,000.

Ill., Arlington Heights—Crop-Saver Chemical Co., Inc., 2511 West Potomac St., Chicago, has awarded the contract for a 1 story factory to N. Ronneberg Co., 3906 North Harlem St., Chicago. Estimated cost $75,000.

Ill., Chicago—Central Waxed Paper Co., 5070 West Roosevelt St., has awarded the contract for a factory to Freevol-Smedberg Co., 5807 West Chicago Ave. Estimated cost $1,000,000.

Ind., Indianapolis—Eli Lilly Co., pharmaceutical manufacturers, Alabama and McCarty Sts., has awarded the contract for a 4 story brick laboratory addition to Leslie Colvin, 507 Board of Trade Bldg., Indianapolis. Estimated cost $225,000.

Kan., McPherson—National Cooperative Refining Assn., McPherson, has awarded the contract for alterations to its plant, machinery and equipment, to Refinery Engineering Co., Wright Bldg., Tulsa, Okla. Estimated cost $200,000.

Ky., Louisville—National Distillers, A.M.S. Div., 120 Bway., New York, N. Y., has awarded the contract for the design and construction of a whiskey warehouse to Sanderson & Porter, 52 William St., New York, N. Y. Estimated cost $600,000.

La., North Baton Rouge—Ethyl Corp., c/o C. E. Colvin, Box 341, Baton Rouge, has awarded the contract for the construction of a pilot plant here to Pioneer Industrial Co., c/o Owner, at $155,264.

Mo., St. Louis—Johnston Foil Mfg. Co., 6106 South Bway., has awarded the contract for the construction of a warehouse for aluminum foil to Robinson Erection Co., 5540 West Park St., St. Louis. Estimated cost $200,000.

Mo., St. Louis—Puritan Compressed Gas Corp., 4526 Olive St., has awarded the contract for the construction of a 1 story, 74x156 ft. warehouse, service and sales building to Jones-Kissner Construction Co., 706 Chestnut St.

N. Y., Long Island City—Stein-Davies Co., 12-10 Jackson Ave., manufacturer of adhesives, textiles, paper sizings, etc., has awarded the contract for the construction of a 5 story, 90x100 ft. factory building with laboratory facilities on the fifth floor, to Turner Construction Co., 420 Lexington Ave., New York 17, N. Y.

Pa., Barnesville—Gulf Oil Corp., 1515 Locust St., Philadelphia, has awarded the contract for a pipe line terminal to Vanguard Construction Corp., 369 Lexington Ave., New York, N. Y. Estimated cost $100,000.

Pa., Johnsonburg—New York & Pennsylvania Co., Johnsonburg, has awarded the contract for a soda recovery plant here to Rust Engineering Co., Clark Bldg., Pittsburgh. Estimated cost $1,000,000.

Pa., Monongahela—Stauffer Chemical Co., Chauncey, N. Y., has awarded the contract for alterations to its plant to Patterson Supply Co., Monongahela. Estimated cost $150,000.

Tex., Crane—El Paso Natural Gas Co., Basset Tower, El Paso, will construct a gas compressor and treating plant. Work will be done with own forces. Estimated cost $1,850,000.

Tex., Quitman—Gaska Corp., Quitman, will enlarge its natural gasoline plant. Work will be done with own forces. Estimated cost $90,000.

Wis., Green Bay—Northern Paper Mill, Green Bay, will construct a 2 and 3 story, 68x104 ft. addition to its paper mill. Work will be done by day labor. Estimated cost $500,000.

Alta., Edmonton—British American Oil Co., Ltd., Edmonton, has awarded the contract for a refinery to Canadian-Kellogg Co., Ltd., 34 Adelaide St., W., Toronto. Estimated cost $8,000,000.

Ont., Amherstburg—Brunner-Mond Canada, Ltd., Amherstburg, will alter and construct additions to its calcium chloride plant. Estimated cost $1,000,000.

Ont., London—Hobbs Glass Co., 57 York St., has awarded the contract for a 1 story, 77x150 ft. plant addition to McKay Cocker Construction Co., 230 Dundas St. Estimated cost $300,000.

Que., St. Laurent—Canadian Industrial Glass Co., Ltd., 8 Napoleon St., has awarded the contract for a 1 story factory to L. Donolo, Inc., 8320 St. Laurence St., Montreal. Estimated cost $750,000.

New "Packaged Unit" designed for aggregates, coal, coke, ores and other bulk materials

Equally applicable for both small or large scale operations, the new Hewitt-Robins Sectional Belt Conveyor is a packaged unit that can be assembled by your own workmen—and in considerably less time than required for conventional conveyors.

From the variety of truss sections, head sections and A-frame supports you can select a conveyor system suited to your needs—in length, height, belt width and capacity. And, when you change locations, the conveyor can be disassembled, with sections added or dropped to suit conditions at the new site.

Like all Hewitt-Robins machinery, this new Sectional Belt Conveyor is carefully designed, strongly constructed. It is equipped with world-famous Robins Troughing and Return Idlers with one-shot lubrication. Curved decking protects the return strand of the belt.

And remember, only Hewitt-Robins is able to take single, unified responsibility for a successful Belt Conveyor installation—machinery and belting. For complete information on the new Hewitt-Robins Sectional Belt Conveyor, write today for Bulletin No. 132. Address Robins Conveyors Division, 270 Passaic Avenue., Passaic, N. J.

HEWITT-ROBINS SECTIONAL BELT CONVEYOR HEAD SECTIONS—3 types of drives to take motors from 2 hp to over 40 hp. Terminal pulleys (both head and tail) are solid welded steel with cast iron hubs.

TRUSS SECTIONS—2 designs—24" deep in lengths of 6'0", 15'0", 18'6," and 21'0"; 42" deep for greater spans. Side members all-welded construction; diagonal bracing members have jig-drilled holes for quick field assembly.

BENT SUPPORTS—A-frames are available in complete range from 4' to 50' deep—easily erected.

BELT WIDTHS—18", 24", 30" and 36". Lengths up to belt limitation.

HEWITT-ROBINS
BELT CONVEYORS

HEWITT-ROBINS HR **INCORPORATED**

BELT CONVEYORS *(belting and machinery)* • BELT AND BUCKET ELEVATORS • CAR SHAKEOUTS • DEWATERIZERS • FEEDERS • FOAM RUBBER PRODUCTS • FOUNDRY SHAKEOUTS • INDUSTRIAL HOSE • MINE CONVEYORS • MOLDED RUBBER GOODS • RUBBERLOKT • ROTARY WIRE BRUSHES • SCREEN CLOTH • SKIP HOISTS • STACKERS • TRANSMISSION BELTING • VIBRATING CONVEYORS, FEEDERS AND SCREENS

How much should a valve cost?

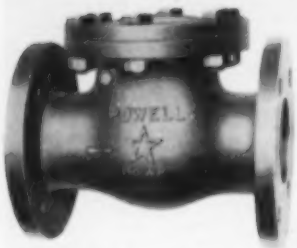
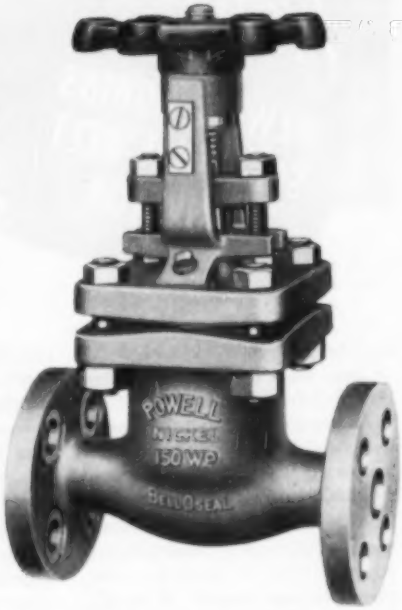


Fig. 2433-M—150-pound Monel Metal Swing Check Valve with flanged ends and bolted flanged cap.

Fig. 1798—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable, specially heat treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium" nickel-bronze disc.

◆ **Fig. 1793**—Large 125-pound Iron Body Bronze Mounted Gate Valve with flanged ends, bolted flanged yoke, outside screw rising stem and tapered solid wedge. Also available in All Iron.

Fig. 1839—200-pound Nickel Gate Valve with screwed ends, screwed-in bonnet, inside screw rising stem.



"Bell-O-Seal" Globe Valve. Powell "Bell-O-Seal" Valves are available in Globe, Angle and "Y" patterns, with screwed, flanged or welding ends. Designed for high vacuum service and for handling hazardous fluids. Can be furnished in various corrosion-resisting metals and alloys. Made in sizes ¼" to 12", inclusive.

POWELL

Only as much as is necessary for it to meet all the conditions under which it must operate.

When the service in which a valve is to be used requires special design and materials, it is poor economy to try to make an inexpensive valve do the job. "Down time", maintenance costs, if not actual valve failure, will far more than offset any initial saving.

On the other hand, in a majority of services, standard Powell Valves satisfy all requirements for long, trouble-free performance.

And, because Powell makes all kinds*, it is the soundest economy to standardize on Powell Valves for all your flow control requirements.

Fig. 3003—Class 300-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke and tapered solid wedge.

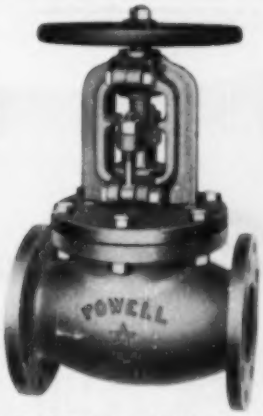


Fig. 2429—150-pound Stainless Steel Globe Valve with flanged ends, bolted flanged yoke and outside screw stem.

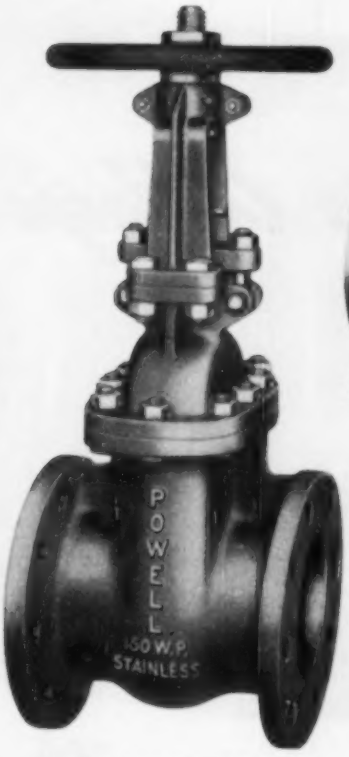


Fig. 2453-G—Large 150-pound Stainless Steel Gate Valve with bolted flanged yoke-bonnet, outside screw rising stem and tapered solid wedge. Made in sizes 5" to 30", inclusive.

*The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.

Ask your nearest Distributor—or write direct

The Wm. Powell Company

Cincinnati 22, Ohio

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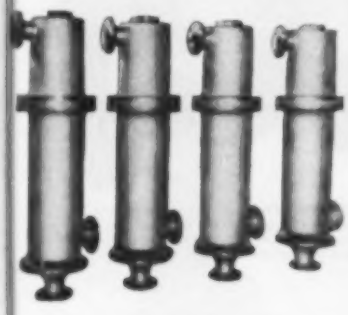
VALVES

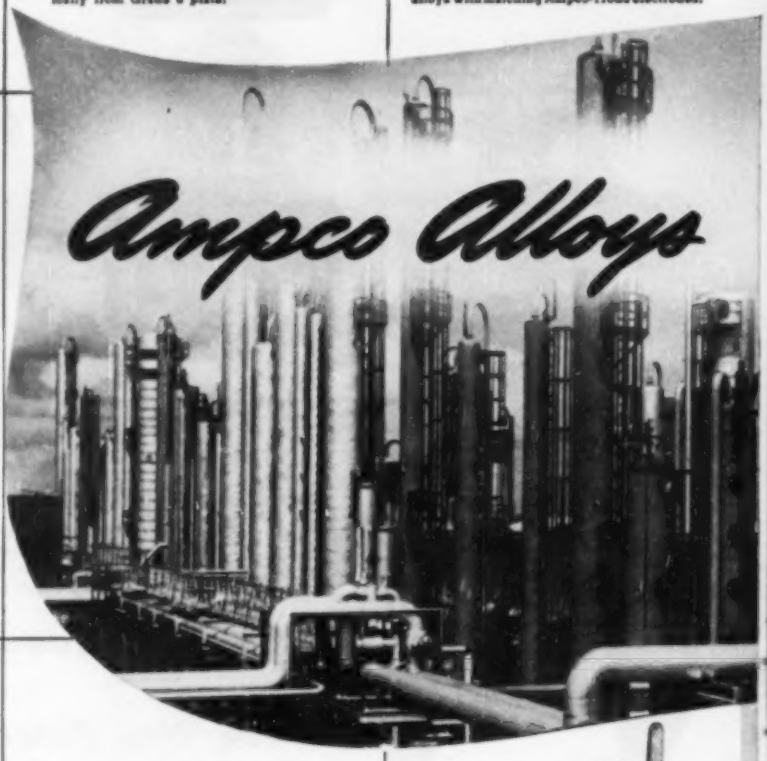
Pipe Fittings — Ampco pipe fittings are available in all sizes . . . ells, tees, crosses, reducing fittings and flanges . . . forged, wrought, fabricated or cast — with flanged, welding or screwed ends . . . schedule 10 through schedule 160.

Process Pipe . . . Prefabricated Ampco alloys selected for resistance to corrosive action of waste liquors. Prefabricated at Milwaukee from centrifugally cast sections, including flanges. Ampco pipe is also available in extruded seamless IPS up to 4" and in larger diameters welded automatically from Grade 8 plate.

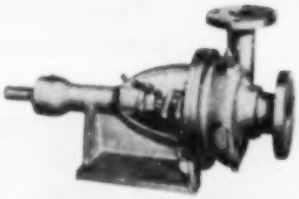
Conveyors . . . Sulphuric Acid Service — Ampco alloys selected for top resistance to erosion, corrosion and abrasion for conveyors handling bulk materials saturated with 10% H_2SO_4 at 210° F. Entire assembly — flights, troughs, shafts, buckets, chain, bearings, etc. — fabricated from Ampco alloys with matching Ampco-Trode electrodes.



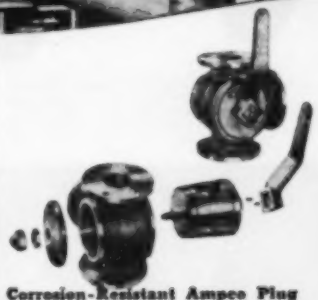
Barometric Condensers and Jet Ejectors — Ampco alloys selected for high strength, corrosion resistance and ability to withstand high-velocity impingement. Sand-cast venturi welded with Ampco-Trode to centrifugally cast body.



Heat Exchangers — Shown above are typical Ampco fabricated exchanger heads. Complete exchangers including tube sheets, tubing, heads and shells made from corrosion-resistant Ampco alloys are available through the fabricator of your choice.

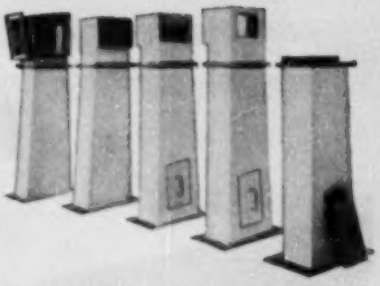


Ampco Centrifugal Pumps — Here — for the first time in pump manufacturing history — is a "production-built" and "production-priced" pump to handle acids, salts, alkalies, and other corrosive agents hitherto requiring specially built pumps. The Ampco single stage, single suction centrifugal pump offers long life, high efficiency and low maintenance costs through the combination of correct design and properly selected materials.



Corrosion-Resistant Ampco Plug Valves — Made of properly mated Ampco alloys to combine operating efficiency with extremely long life — under the most severe conditions of corrosion, erosion, cavitation, and abrasion. No pockets to trap corrosive liquid. Available from ½ inch up to any desired pressure, in straight-through (2-way) or 3-way, lubricated or non-lubricated types.

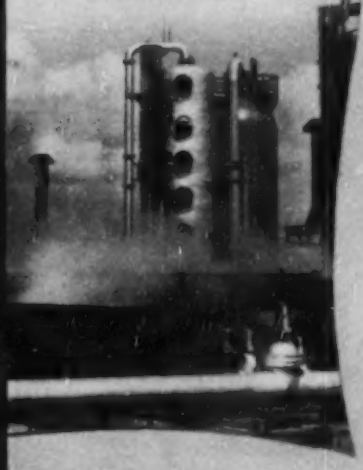
Fractionating Tower...Acetic Acid — Ampco alloys selected for resistance to corrosion by acetic and formic acids . . . and for maximum retention of physicals at temperatures up to 500° F. Fabricated of corrosion-resistant Ampco alloys throughout . . . deep-drawn sheet, plate, extruded tubing, centrifugal castings, etc. . . . welded with Ampco-Trode 180 electrodes.



Chutes . . . Potash Production — Ampco alloys selected to resist the severe erosive and corrosive effects of the mixture being carried. Fabricated of ¼" thick corrosion-resistant Ampco 8 plate welded with Ampco-Trode 180 electrodes. No pre-heating or post-heating was required. The weld joints match the parent-metal in chemical and physical properties.

AMPCO

Resist Corrosion, Reduce Costs



...with this unique combination of money-saving properties:

1. High resistance to corrosion
2. High tensile strength
3. High physicals at extreme temperatures
4. High weight to strength ratio
5. High impact and fatigue values
6. High wear-resistance — to erosion — corrosion, cavitation, etc.
7. High compressive strength
8. High modulus of elasticity

The long service life of Ampco Bronze Alloys — at a moderate initial cost — offers unusual savings to both designers and plant engineers.

Reduced material failures mean (a) minimum down-time (b) less production loss and (c) lower maintenance costs.

Increase efficiency of design and operation . . . specify Ampco Bronze alloys for handling corrosive and erosive media. Write today for recommendation and complete information.

Ampco aluminum bronzes are available in a number of grades to meet your exact requirements in any form you need: rolled sheet or plate, sand or centrifugal castings, forgings or extrusions . . . pipe and fittings. Also, Ampco's arc-welding electrodes, corrosion-resistant centrifugal pumps and plug valves.

Free . . . Process Industries Bulletin — 16 pages of money-saving information

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• This completely new 48-page book entitled "Mathieson Caustic Soda" is now available to users throughout industry. Fully illustrated, it covers in detail the manufacture, economics, properties, handling and sampling of this product.

In 1923, Mathieson was the first to make regular shipments of caustic soda in liquid form. Today, because of the expanded productive capacities of its three large plants at Saltville, Va., Lake Charles, La., and Niagara Falls, N. Y., Mathieson is recognized as one of the leading suppliers of liquid caustic soda.

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Dual Fuel Operation

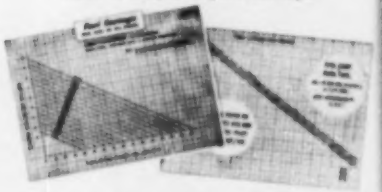
these standard FAIRBANKS-MORSE Diesel Engines are available as—or may be converted to

Dual Fuel

MODEL 38
Opposed-Piston
Engine: 640 to 1920
horsepower at 720 r.p.m.

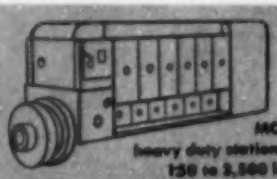
If you are situated where natural gas is or soon will be available, don't fail to investigate the savings possible through installing Fairbanks-Morse Dual-Fuel engines — or converting your present Fairbanks-Morse equipment to Dual-Fuel operation. The economies in running on low-cost natural gas or diesel fuel are easy to estimate — and surprisingly high! Today Fairbanks-Morse is the largest supplier of dual-fuel engines — over a hundred plants are cutting the cost of fuel to new rock bottom lows. To figure how much you can save, send for the charts shown below — or call your Fairbanks-Morse diesel specialist.

HANDY CHARTS
make it easy to figure savings!



Charts that show you exactly the savings you can make in fuel cost by using Fairbanks-Morse Dual-Fuel engines are available. Ask your Fairbanks-Morse diesel specialist or write the nearest branch office.

This MODEL 33 Fairbanks-Morse Engine was converted to Dual-Fuel in the field at low cost. Sizes to 2,000 horsepower.



MODEL 31: for heavy duty stationary service: 150 to 2,500 horsepower.

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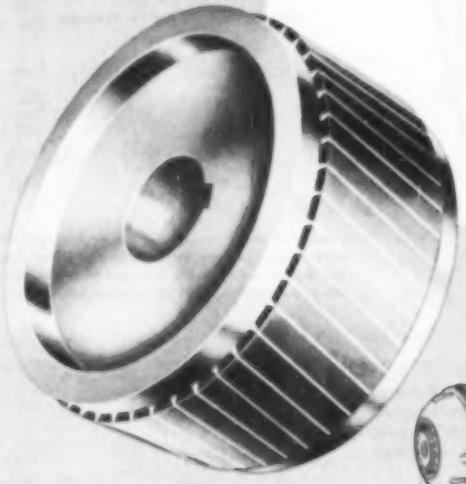
In your Fairbanks-Morse branch you have a single source for all your motor and generator requirements. There you can get advice and service that are not limited by restrictions in available sizes and types — that are underwritten by the broadest contact with motor applications like yours. Hundreds of plants are fully equipped with motors bearing the Fairbanks-Morse name — including everything from fractional ratings — through standard and specialized types of all sizes — up to and including large generating equipment. Why not have this experience working for you? Write or call the nearest sales center listed below.

Axial Air-Gap Motors



EXCLUSIVE *Copperspun Rotor* IS INDESTRUCTIBLE . . .

Identifying all Fairbanks-Morse motors in the more popular ratings, the Copperspun Rotor is a prime reason for their reputation for long-run sturdiness with little maintenance expense. Truly indestructible, the rotor is centrifugally cast and, with its well proportioned shaft, dynamically balanced to insure smooth and quiet operation. This exclusive Fairbanks-Morse feature is another reason why you should visit or write your nearest Fairbanks-Morse sales center to get the whole story on the motors which interest you.

General-Purpose Protected Frame Squirrel-Cage Motors

Explosion-proof Motors

Totally Enclosed Fan-cooled Motors

Totally Enclosed Non-Ventilated Motors

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FAIRBANKS-MORSE

Newest Pump is up to 25 times as "Non-Clog" as conventional types!

A pump for every purpose in the FAIRBANKS-MORSE line *here are a few...*

One of the latest Fairbanks-Morse achievements in hydraulic engineering, this truly *non-clog* pump makes possible amazing efficiency in pumping water containing solids and/or trashy material such as industrial waste, sewage — even such things as fish, fruit, etc. Its advanced hydraulic characteristics permit the use of smaller driving motors, and it is interchangeable with Fairbanks-Morse pumps of corresponding size in existing installations. Proved in two years of actual service, this Fairbanks-Morse non-clog pump promises solutions to industrial pumping problems heretofore thought to be impossible. For full details write or call your Fairbanks-Morse sales center.

AMAZING NEW

Bladeless Impeller!

The impeller of this pump is a single helical channel — a "whirling tube" — there are no blades, no restrictions to the free passage of fibrous trash. Observers have been amazed at the ability of this impeller to pump consistently stringy, irregular trashy materials.

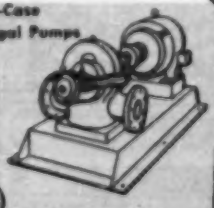
Fairbanks-Morse Non-Clog Pump — 2-inch to 5-inch sizes with wide range of capacities.

Westco Turbine Pumps

Rotary Pumps

Vertical Turbine Deep Well Pumps

Built-together Pumps



Split-Case Centrifugal Pumps

Vertical Angle-Flow Pumps

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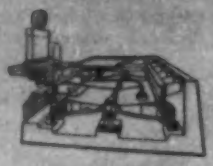
Profits can be Measured by the Pound

For every weighing operation there is a famous FAIRBANKS-MORSE *Scale*

. . . and so can losses, too! If weighing operations throughout your plant are less than absolutely accurate, the way is open to inefficiencies and losses, hard to discover, tough on the cost sheet. That's why it's a good idea to call on a Fairbanks-Morse weighing specialist: let him scan closely every weighing and bulk measurement function in your plant with an eye toward eliminating sources of inaccuracy, speeding up weighing services and breaking weighing "bottlenecks" wherever they're found. Remember, he is backed by over 100 years of scale research and development — and has the most complete line of industrial scales to use in solving your specialized problems.



Motor Truck Scale

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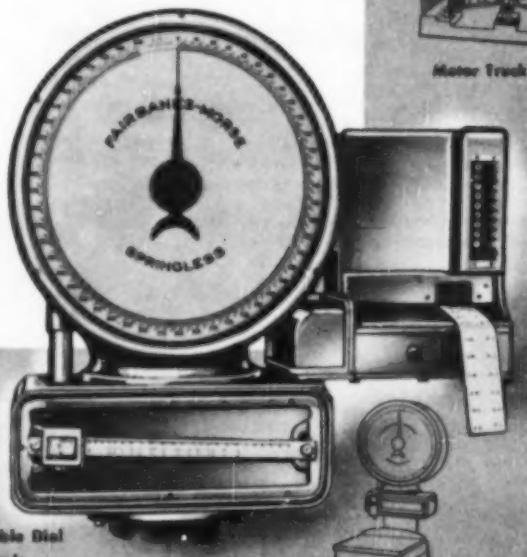
Load the scale . . . press the button . . . and receive the correct weight printed on a ticket. This is the modern method of weighing developed by Fairbanks-Morse in the Printomatic weigher, one of the most modern, most versatile scales on the market—ideal for batching operations, weighing of liquids, food products, grain, dairy products, coal, steel, component parts, finished products, etc. Thousands in daily use! To know more about Printomatic, ask your Fairbanks-Morse sales specialist.



Belt Conveyor Scale

Portable Dial Scale

Printomatic Dial Scale

Bench Scale

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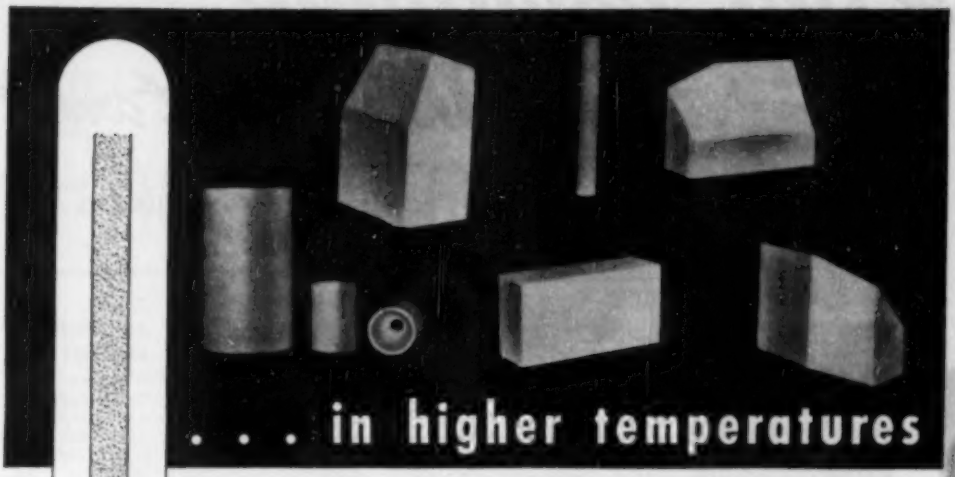
Export Division: NEW YORK 4, N. Y., 49 Second Street

A-2-8 100.0 Prod. in U.S.A.

PURE OXIDE shapes work better . . .



. . . in higher temperatures

In your own plant processes, you may be following today's trend to higher operating temperatures. And although higher temperatures are either speeding up old processes or producing new products, they are also increasing the demand for super duty refractories that will stand the gaff at high heat.

To meet these requirements, Norton Company is producing for industry a line of pure oxide refractories. These pure oxides, as the term implies, are made from raw materials which have been carefully selected as to source, composition, and high melting point.

Norton pure oxide refractories contain 99% plus of an oxide which may be fused alumina, magnesia, or stabilized zirconia. From these three materials, super duty refractories are regularly being produced in standard and special shapes (a few of which are illustrated above). Alumina and stabilized zirconia shapes can be made in dense form, having good thermal conductivity, or with open structure, in which condition they are excellent thermal insulators.

High purity alumina, magnesia, and stabilized zirconia are also available in the form of grain for use as a raw manufacturing material or for thermal insulation. Grains of both high and low thermal conductivity make it possible to control heat loss.

Further information on high temperature refractories will be supplied gladly upon your request. Much information may be obtained from our free bulletin POR-151. If you desire to correspond with us concerning the application of Norton pure oxide refractories to your plant processes, please address your correspondence to the Refractories Division.

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NORTON COMPANY, WORCESTER 6, MASS.

in ION-EXCHANGE it's RESULTS that count!

Check . . . THESE CASE HISTORIES OF DORRCO d-i INSTALLATIONS . . .

FOR ANODIZING BATHS

Double installation provides two successive stages – units in operation four years with no resin replacements.

Results: Saving of over 90% on process water costs . . . improved control in anodizing operation. Average overall operating expense (including labor) – 32.1 cents per thousand gallons of de-ionized water produced!

FOR CARBONATED BEVERAGES

A Dorrco D-I Unit, four years old, still operates exactly as specified when sold . . . and with original resins.

Results: Taste and "shelf-life" of finished product improved . . . pin-point carbonation attained. Overall operating cost – two-tenths of a cent per case of twelve 28-oz. bottles!

FOR COSMETIC MANUFACTURE

Dorrco D-I Unit installed over 3 years ago . . . no resin replacements required.

Results: D-I water cut costs when substituted for distilled water . . . process variable eliminated when substituted for raw water. Total operating expense – 13 cents per thousand gallons of de-ionized water produced!

FOR PHARMACEUTICAL MANUFACTURE

D-I water meets strict operating requirements over a four year period . . . with no resin replacements.

Results: Product quality improved . . . variable of fluctuating quality in water supply eliminated. Average overall operating expense – 42 cents per thousand gallons of de-ionized water produced!

We believe these results speak for themselves. Regardless of industry, if your process requires water of controlled mineral content, a Dorrco D-I System will produce it . . . in any amount . . . at a fraction of the cost of distillation. Write for Bulletin #4081 for complete details.

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GREATER OPTICAL ACCURACY
Precision square absorption cells with plano-parallel surfaces eliminate errors inherent with ordinary curved cells. Optical system is designed to eliminate possibility of stray light with attendant error.

MORE ACCURATE READINGS
Only the Rouy Photrometer cuts functional error to within 0.1%.

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Only the new Rouy Photrometer has photoelectric cell and microammeter matched so carefully that measurement of electrical energy is strictly linear to transmitted light energy.

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Ten narrow band filters cover the entire visible spectrum. Two extra spaces provide for special filters.

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All adjustments made with a single control. Any competent laboratory worker can use the new Rouy Photrometer.

$210.00 with ten filters,
sealed H_2O absorption cell, four square 10 mm. absorption cells (5 mm. and 20 mm. cells with adapter rings also available), handbook with operating instructions.

No other colorimetric instrument can equal the Rouy-Photrometer in speeding up routine chemical controls while insuring a high standard of accuracy. Extensive tests and performance in the field have demonstrated its suitability for use in such varied industries as water supply, foods, electro-plating, metallurgy, wherever colorimetric methods spell better process control.

Leitz representatives will be happy at any time to advise you on how the Rouy Photrometer can be applied in your industry.

For information, write **E. LEITZ, Inc.,** 304 Hudson Street, New York 13, N.Y.

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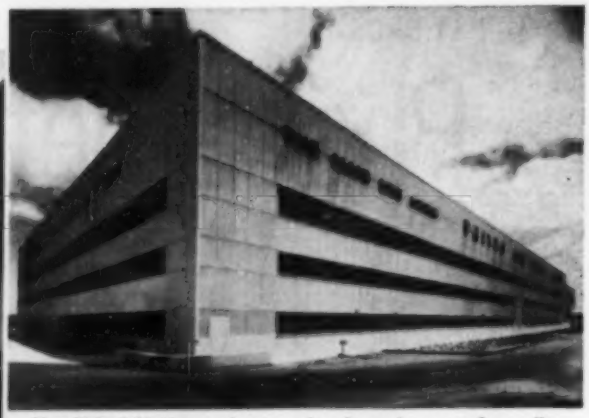
CORRUGATED TRANSITE*... inside or out!

*Transite is a registered Johns-Manville trade mark

Newport Steel Corporation of Detroit utilized J-M Corrugated Transite for interiors. The corrugations increase the unusual strength of these asbestos-cement sheets. This allows minimum framing, provides functional decoration when used with architectural good taste as in the example above.

Natural stone-gray in color, Corrugated Transite is often used without further decoration, thus contributes another economy.

(In this installation, flat sheets of Transite were also used to finish ceilings and some of the wall areas.)



New United Air Lines maintenance base has maintenance-free walls of J-M Corrugated Transite.

Long a favorite for exterior construction, Asbestos Corrugated Transite is also being used to create attractive interiors. Tough Transite sheets can't burn, rot, or rust—and they're *not expensive*.

Architects, engineers, and builders are constantly discovering new uses for J-M Corrugated Transite, partly because it is so effective in modern streamlined design.

At first this building material attracted attention because of its durability—*fireproof, rotproof, weatherproof.* Made of materials that are practically indestructible (asbestos and cement), it was rapidly accepted as an exterior siding and roofing for industrial buildings.

But that was just the start of a construction career that has become more and more versatile. Today Corrugated Transite is contributing structural attractiveness to smart shops, office buildings, even art galleries—*inside* as well as outside.

Many architects are now specifying Corrugated Transite combined with insulating materials for curtain walls. Recently, Corrugated Transite in curtain wall construction was used on a new power plant addition where it reduced the load-bearing factor 83%! The versatility of this material is amazing. Write for brochure to Johns-Manville, Box 290, New York 16, N. Y.

EASY TO BOLT TO STEEL

EASY TO SAW

EASY TO DRILL

EASY TO NAIL TO WOOD

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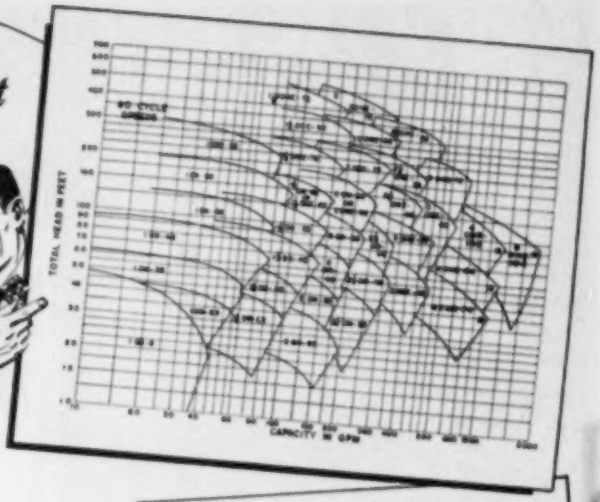
Johns-Manville *Asbestos* **CORRUGATED TRANSITE**

Whatever You Want in a General Utility Pump ...Here It Is!



OVER 10,000 STANDARD COMBINATIONS WITH WORTHINGTON CN AND DN CENTRIFUGALS!

The modern answer to today's small pump problems — Worthington CN and DN Pumps offer a breadth of coverage and a choice of style that will suit your requirements to a T. Hydraulically, both types are identical. Their liquid ends, of the same highly efficient, up-to-the-minute design, are interchangeable, and can be equipped with either conventional packing or mechanical seal.

Type CN, frame-mounted, is a real "any-drive" pump — readily driven by an electric motor, V-belt, or any other mechanical power-source. Type DN is the famous Worthington Monobloc design — compact, streamlined, with built-in motor.

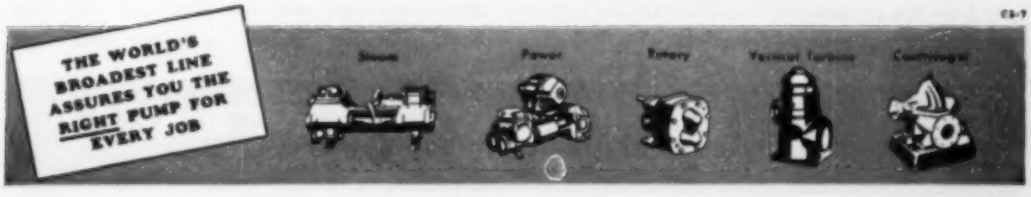
This Is Real Coverage

With the CN and DN you have 40 sizes of pump-casings to choose from, with capacities from 10 to 1750 gpm and heads from 20 to 500 ft., as shown on the above chart. There are 200 combinations of frame-mounted designs and, considering both type pumps, over 10,000 standard combinations! Despite this wide range — the CN and DN pumps are designed to have maximum interchangeability of component parts.

From this vast selection you're sure to find the combination that will meet your pumping needs. That means the end of compromising with pumps that are not just right for *you* — and the beginning of the money-saving performance that proves *there's more worth in Worthington*. For details, contact our nearest District Office, or write to *Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, New Jersey*.

WORTHINGTON

CD-7



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Republic Pneumatic Transmitters are available for measuring flow, liquid level, pressure or liquid density of a wide range of fluids. They employ the force-balance principle to convert these process variables into air pressures which vary proportionally. These air pressures become direct measurements and can be conducted to reading instruments or used as the measuring impulse for the actuation of an automatic controller.

Republic transmitters have a guaranteed accuracy of within 1/2 of 1% of the transmitter range. By making a few minor adjustments or substituting a few small parts, their operation can be easily changed to any desired range between a minimum of 0-0.6" to a maximum of 0-704" of water. Their construction is more like that of a precision machine than of the sensitive instrument they are. Data Book No. 1001 contains complete details — write for your copy.

REPUBLIC FLOW METERS CO.

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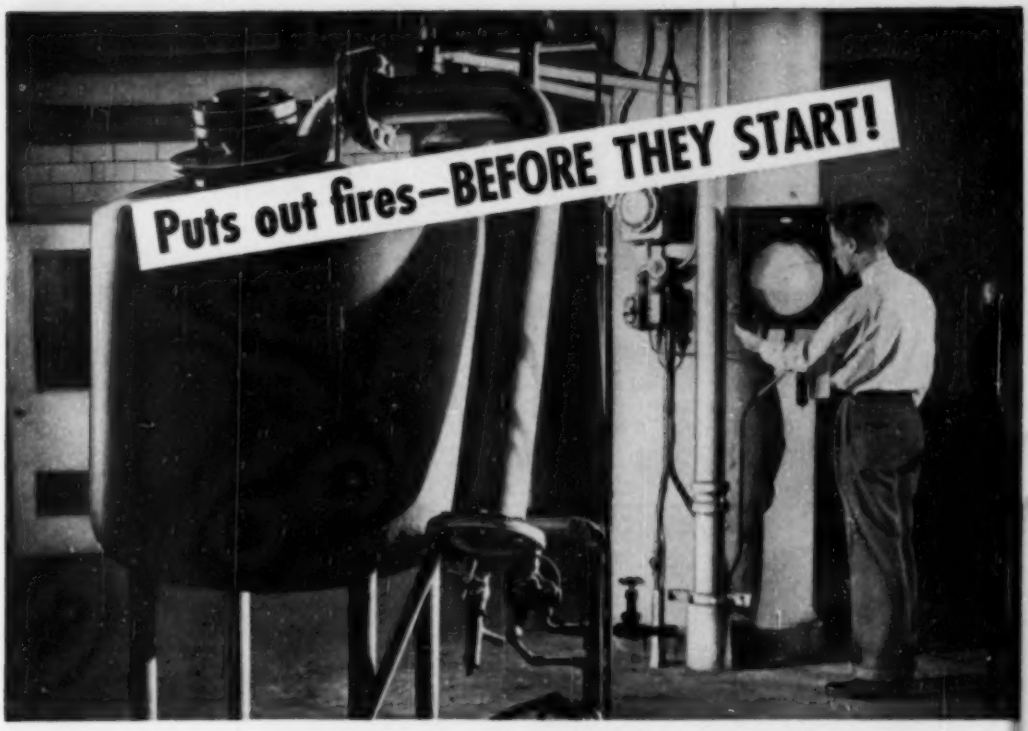

Automatic CO_2 Extinguishing System Protects Still in Pharmaceutical Plant

Here's a fire-fighting system that's designed *never to fight a fire!* Smith, Kline & French Laboratories, large pharmaceuticals manufacturer, have in their Philadelphia plant an installation that stops fires *before* they start.

A still used in refining chemical ingredients requires a vacuum of 29½ inches of mercury. If air enters this distillation process, combustion will result. Kidde engineers, cooperating with Smith, Kline & French engineers, answered this tough problem by designing a different actuating method.

When the vacuum drops to a predetermined danger point it automatically trips the *Kidde* extinguishing system. It floods the still with fire-smothering CO_2 gas—and fire cannot occur. Moreover, the dry, clean, non-contaminating CO_2 from the *Kidde* system doesn't dilute the chemicals, won't mess up the still.

Here is safe, sure, 24-hour-a-day protection that completely eliminates the human element. For the usual or the *unusual* problems of fire detection and prevention, see Kidde.

When you think of CO_2 call Kidde.

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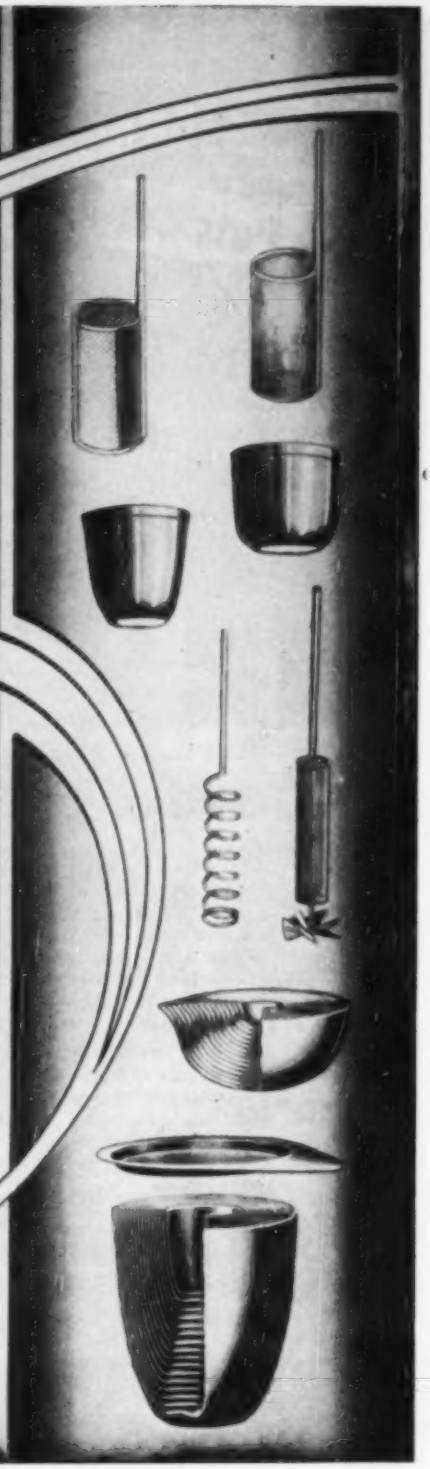
Because, naturally, our large scientific laboratories use apparatus manufactured by us in their own work, Baker Laboratory Ware is constantly subjected to continuous tests through use and so we are enabled to detect the need for improvements. An example was our observation of the tendency of stationary type electrodes to break at the junction of stem and cylinder, a fault which we overcame by reinforcing this joint.

Let us send you a copy of *Data Concerning Platinum*. It tells about our products and is a very valuable reference work too.



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You will find the answer because the WeldELL line incorporates job-speeding, cost-cutting features that are combined in no other welding fitting.

You will find the answer because the WeldELL line expresses the best of all we have learned in fifty years of intensive specialization in forged fittings for designed piping and pressure vessels.

The WeldELL line also goes beyond all others in range of sizes, types, thicknesses and scope of materials. Form a good habit—the WeldELL habit. Your reward will be the deep-down satisfaction of using the best there is! Coupon brings catalog.

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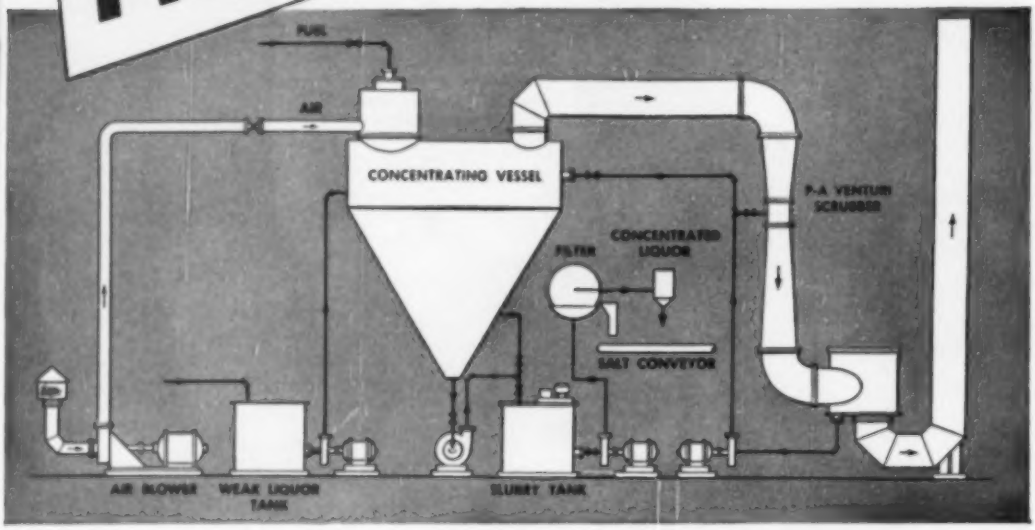
...With The New Chemico High Temperature Concentrator



HERE, at last, is a practical and profitable method of recovering sulfuric acid from waste pickling liquor. This liquor, containing sulfuric acid and ferrous sulfate is concentrated by subjecting it to high temperature combustion gases released under the surface of the liquid. During this operation, part of the pickling liquor is continuously withdrawn and precipitated sulfate removed by filtration.

The free sulfuric acid can be concentrated to any reasonable strength, with either a one or two-stage process. Ordinarily single stage concentration is used for acid strengths up to 70% where practically all of the ferrous sulfate is removed. Further concentration to 93% may be effected in a second stage.

If complete recovery is desired, this sulfate can be roasted with coal or pyrite to produce iron oxide sinter and SO_2 which is then purified and processed to additional sulfuric acid in a conventional contact plant.

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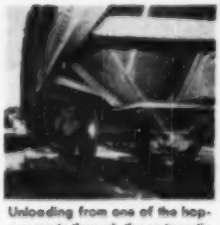
smoother riding
—on G-W bulk handling equipment means
less "break-up" for carbon black pellets

Showing enclosed, motor operated belt feeders, continuous bucket elevators and storage tank on roof of plant.

Slow speed continuous bucket elevator carries pellets from conveyor beneath track level to roof storage.



Unloading from one of the hopper ports through the automatic car sealing valve.

Materials handling systems for bulk chemicals is a G-W specialty. A typical example is the system illustrated here for conveying and elevating pelletized carbon black from hopper car to process. Advantages of this type of installation are many, some of which are:

1—**Carbon black dust is virtually eliminated since the system is completely enclosed from automatic car sealing valves through storage bin to process.**
2—**Valuable floor space is released since bulk storage can be located on roof or any other outside point.**
3—**Handling is automatic which eliminates up to four separate handling operations, necessary when carbon black is used in non-pelletized form.**
4—**One man can unload a full car in less than six hours, his only manual effort being to fasten unloading chutes to car ports.**

If you have a problem handling chemicals in bulk, be it carbon black, soda ash, sodium sulphate, chrome ore, bauxite, etc., consult a G-W Materials Handling Engineer. He is backed by 136 years of engineering design and knowledge in the materials handling field. His recommendations, drawn from this extensive experience can point the way to more economical movement and storage of materials in your plant.

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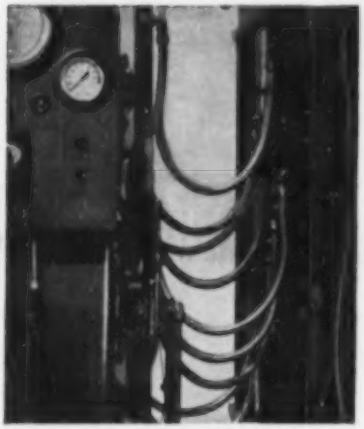


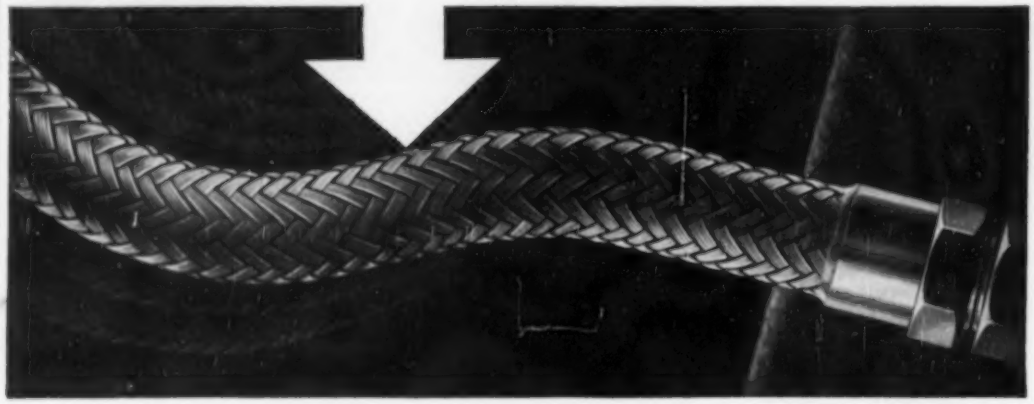
Steam to the moving platens of this hot plate press, made by Williams, White & Co., of Moline, Ill., is carried through these ½" I. D. Bronze American Seamless Flexible Metal Connectors.

Are you plagued with piping that must move, that vibrates, or has connections that are out of alignment?

Whether it carries fluids, gases, semisolids or steam, there's a type of American *Seamless* Flexible Metal Tubing or Flexible Metal Hose to do the job. Neither heat, pressure nor corrosion presents a problem.

American Seamless Flexible Tubing is made of seamless corrugated tubes of bronze and other workable metals, in standard sizes from ⅛" up. They are reinforced with one, two or three pressure-resistant coverings of wire braid. American Flexible Metal Hose is made of spirally wound continuous strips of brass, bronze, aluminum, steel and other metals in ⅛" to 12" I. D. sizes.

For illustrated literature, or the help of our Technical Department, just address The American Brass Company, American Metal Hose Branch, Waterbury 88, Connecticut. In Canada, The Canadian Fairbanks-Morse Co., Ltd.



wherever connectors must **move**

ANACONDA

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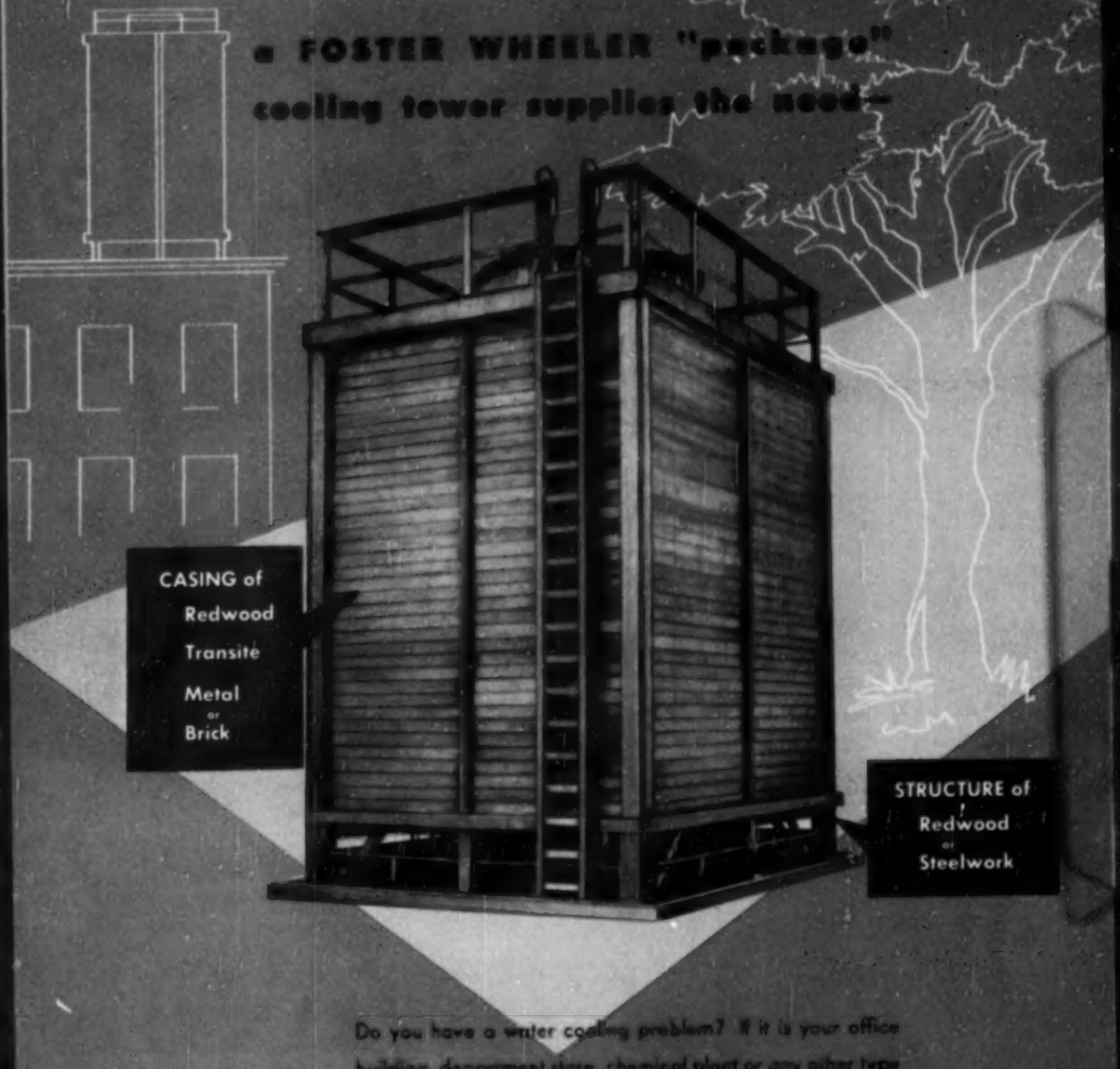

Do you have a water cooling problem? If it is your office building, department store, chemical plant or any other type of industrial establishment or institution, Foster Wheeler offers a "Package" Cooling Tower which can reduce your present cooling water consumption to a mere 2%.

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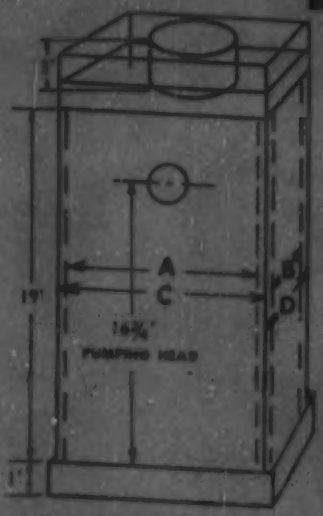
Principal dimensions of standard package cooling towers

for capacities from 75 to 750 gpm



A	B	C	D
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8	8	9	9
8	12	9	13
12	12	13	13
12	16	13	17

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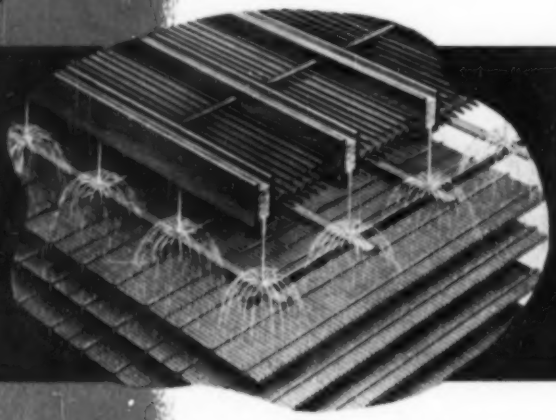

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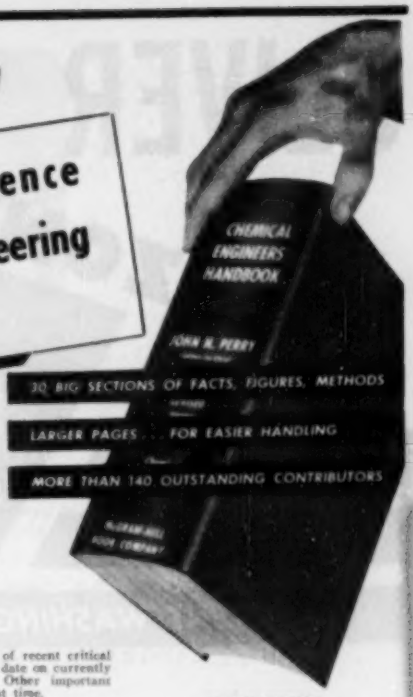
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VERSATILE

FAST FILTERING

EXCELLENT WASHING

Handling Such Products as:

- Silica Gel
- Anhydrous Sodium Sulphate
- Sodium Ferrocyanide
- Potash
- Carbon
- Zinc Chloride
- Ammonium Sulphate
- Agar
- Cotton Linters

Keep in mind these three features of the Oliver Horizontal Filter:

(1) cake formation aided by gravity

(2) washing features: wash solutions in varying strength can be applied where desired; filtrate from various sections can be kept separate

(3) all operations are visible: feed, cake forming, wash application and cake discharge

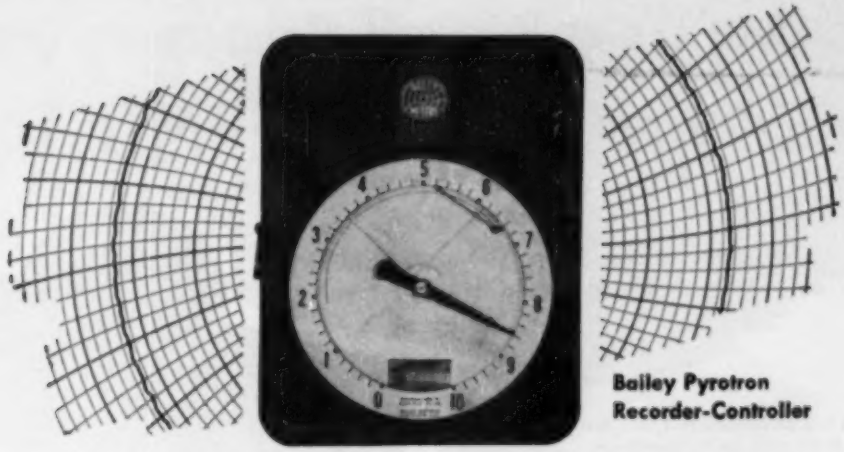
At the recent Chemical Show in New York, this Oliver Horizontal Filter created more interest seemingly than all the filters combined. Hundreds came into our booth to discuss its application. It can really take care of many filtering problems better than any other type of filter.

If you have *any* filtering step where the products are relatively free-filtering, you should investigate its merits for your problem. In sending for Bulletin No. 218, which gives more details, tell us your filtering problem.

OLIVER UNITED FILTERS INC.

New York–33 West 42nd Street
Oakland–2900 Glascock Street
Chicago–221 N. La Salle Street
San Francisco–260 Calif. St.

Factories: Hazleton, Pa. • Oakland, Calif.
Cable–OLIUNIFILT
Export Sales Office–New York



Bailey Pyrotron
Recorder-Controller

Looking for Better Temperature Instruments?

. . . Then check these features of Pyrotron Electronic Resistance Thermometers . . .

FUNDAMENTAL ACCURACY

Bailey Pyrotron Resistance Elements are made of highest purity platinum—the material used by the National Bureau of Standards in establishing basic standards for temperatures from −190°C to +660°C.

THREE TYPES OF CONTROL

Pyrotron Controllers may operate: on-off electrical systems by either electronic relays or electric contacts, modulated electronic systems, or air-operated systems. Two temperatures may be recorded on the same chart and controlled by a single instrument.

FACTS PUT INTO USABLE FORM

Bailey Pyrotrons may be arranged to put temperature facts into convenient usable forms. If two or more temperatures are related, they may be recorded as continuous records on the same chart for easy comparison. The average of several temperatures or the difference between two temperatures may be recorded as a single continuous record which may be retransmitted to a distant point or used to actuate a control system.

EASY INSTALLATION

Bailey Pyrotrons do not require careful leveling or protection against vibration. Three ordinary copper wires are all that is needed to connect each temperature sensitive element with the recorder. Power may be taken from any 115 volt 60 cycle circuit.

MINIMUM MAINTENANCE

The absence of galvanometers, batteries and standardizing equipment, together with the use of interchangeable unit assemblies, reduces Pyrotron maintenance to the vanishing point.

ABUNDANT POWER

A separate motor drive for each temperature furnishes abundant power to operate a recording pen, a controller and an alarm switch.

For the full story on this unusual electronic resistance thermometer which is suitable for ranges between −300°F and 1200°F, ask for Bulletin No. 230-C. P-21

BAILEY METER COMPANY

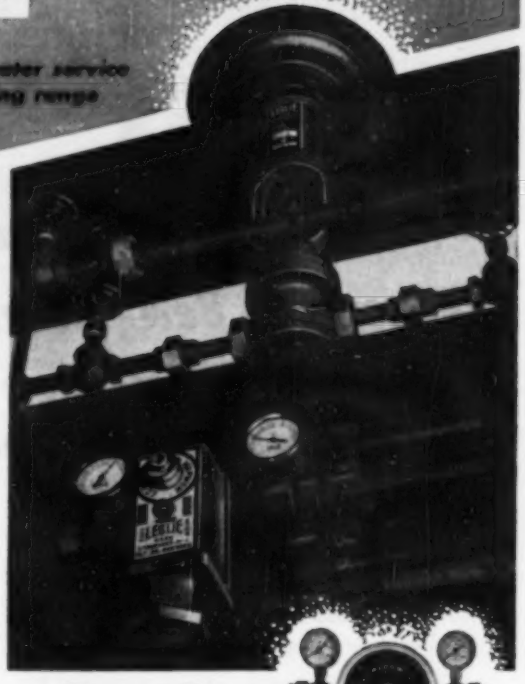
1054 IVANHOE ROAD • • • CLEVELAND 10, OHIO

Controls for Processing

TEMPERATURE
PRESSURE
% OXYGEN
% COMBUSTION
FLOW
LEVEL
DENSITY
RATIO

Reduce Water Bills and Maintenance Costs with the New LESLIE THERMOSTAT

Specially designed for cooling water service with greatly increased throttling range



It is a recognized fact that water cooled equipment such as air compressors, diesel engines, etc., perform better and require less maintenance if cooling water temperature is accurately maintained. The importance of cooling water control has become accentuated with the growing need for conserving water. The new LESLIE Thermostat and diaphragm Regulating Valve make an ideal Temperature Controller for economic, reliable control of cooling water.

The bi-metallic Thermostat regulates the flow of water (or air) to the diaphragm of the Regulating Valve to maintain a constant water temperature at the bulb location. A slight temperature change repositions the Regulating Valve and regulates the flow of cooling water.

Features of the New LESLIE Thermostat

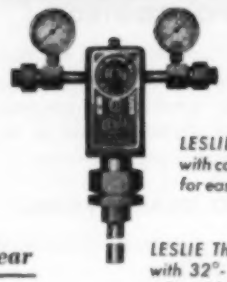
THROTTLING RANGE—Wide or narrow throttling range can be furnished with adjustable temperature ranges, 32°—400°F and 300°—600°F.

BI-METALLIC ELEMENT—Expansion or contraction of metallic tube provides positive operating force.

SIMPLE—Few moving parts. Simple pilot valve operates without stuffing box or plunger.

RUGGED, RELIABLE—Wear and corrosion-resistant parts give long life. Accuracy of regulation comparable to instrument control.

For small units requiring only ½ or ¾" cooling water supply use the LESLIE Self-Contained Classes MDR, MCR or MBR Temperature Regulators.



LESLIE Thermostat with calibrated dial for easy adjustment

LESLIE Thermostat with 32°-400°F adjustable range

Lowest Overall Cost per Operating Year

Send For — Bulletin 464-B
"Temperature Regulators and Controllers"

50th Anniversary 1900–1950

ESTABLISHED 1900

LESLIE CO.

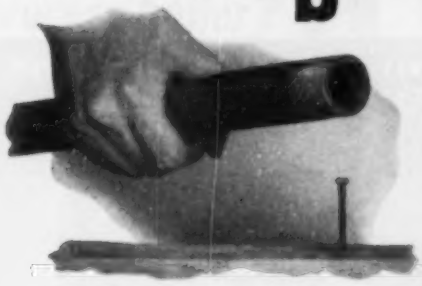
Look for LESLIE REGULATORS under "Valves" or "Regulators" in your classified telephone directory in the following cities where LESLIE factory-trained engineers are located.

Albany, N. Y.	Cincinnati, Ohio	Indianapolis, Ind.	Mobile, Ala.	Penco City, Okla.	Seattle, Wash.
Atlanta, Ga.	Cleveland, Ohio	Kansas City, Mo.	Monroe, La.	Portland, Ore.	Spokane, Wash.
Baltimore, Md.	Denver, Colo.	Kingsport, Tenn.	Montreal, Canada	Providence, R. I.	St. Louis, Mo.
Beaumont, Tex.	Detroit, Mich.	Los Angeles, Calif.	New Orleans, La.	Richmond, Va.	Syracuse, N. Y.
Birmingham, Ala.	Galveston, Tex.	Louisville, Ky.	New York, N. Y.	Rochester, N. Y.	Toronto, Canada
Boston, Mass.	Greensboro, N. C.	Memphis, Tenn.	Orlando, Fla.	Rutherford, N. J.	Vancouver, Canada
Bridgeport, Conn.	Greenville, S. C.	Milwaukee, Wis.	Philadelphia, Pa.	Salt Lake City, Utah	Wilkes-Barre, Pa.
Buffalo, N. Y.	Honolulu, Hawaii	Minneapolis, Minn.	Pittsburgh, Pa.	San Francisco, Calif.	Wilmington, Calif.
Chicago, Ill.	Houston, Texas			Savannah, Ga.	Youngstown, Ohio

279 Grant Avenue Lyndhurst, New Jersey

FLOATLESS LEVEL CONTROLS • PRESSURE REDUCING VALVES • PRESSURE CONTROLLERS
SELF CLEANING STRAINERS • PUMP GOVERNORS • TEMPERATURE REGULATORS
• AIR HORNS • STEAM WHISTLES

Amazing New Pipe *and* Fittings USCOLITE



SO TOUGH YOU CAN DRIVE A NAIL WITH IT

NO METALLIC CONTAMINATION

FURNISHED IN STANDARD LENGTHS YOU CAN CUT TO SIZE AND THREAD ON THE JOB

HANDLES CORROSIVE CHEMICALS, ACIDS, ALKALIS, SALTS

A remarkably strong and versatile plastic piping, resistant to most commonly used industrial chemicals has been produced by the scientists of United States Rubber Company. Known as "USCOLITE" this new material has an extremely high impact strength. Furnished in standard lengths, it can be cut to length and threaded on the job. Uscolite Pipe Fittings are also available. The "U. S." engineering staff will provide more detailed information upon request. Write to address below.

A PRODUCT OF

U.S. RUBBER
SERVING THROUGH SCIENCE

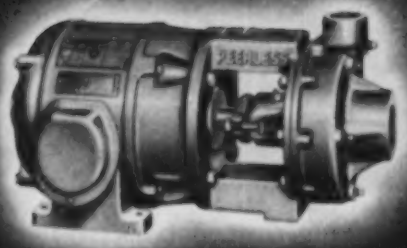
UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

DURABLE • ECONOMICAL • GENERAL UTILITY
PUMPS FOR ALL ORDINARY LIQUID PUMPING SERVICES

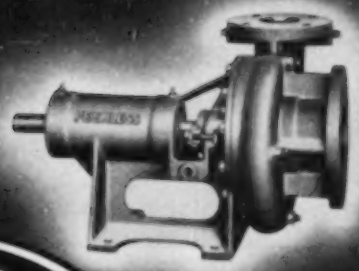
THE PEERLESS *Fluidyne* LINE

CLOSE-COUPLED TYPE
Integral H. P.



Type PE MOTOR SIZE: 1-40 H.P.
CAPACITY: Up to 5500 gpm
HEADS: Up to 270 Feet

BELTED OR DIRECT-CONNECTED TYPE *Integral H. P.*



Type PB MOTOR SIZE: 1-40 H.P.
CAPACITY: Up to 5500 gpm
HEADS: Up to 270 Feet

PEERLESS PUMPS

COMPLETE RANGE OF SIZES FROM ¼ TO 40 H.P.

CAPACITIES: UP TO 5500 G.P.M. • HEADS: UP TO 270 FEET

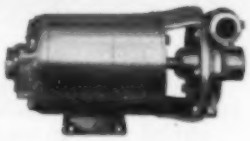
Want compactness? Want efficiency? Want durability? Want economy? You can have them all by using pumps in the versatile and complete line of Peerless Fluidyne general-purpose pumps. Versatile, because they can be applied to a host of diversified services calling for transfering of liquids such as water for air conditioning or cooling and refrigeration systems, mild alkaline solutions, booster service, process uses and many others. Complete, because they offer widest range of sizes and models. The Type PE Fluidyne pump, a close-coupled bracket-type pump is electric drive, available from ¼ to 40 h.p. It is direct-connected to standard NEMA electric motors. The Type PB offers the same wide h.p. range but differs from the PE in that it is built to receive standard V or flat belt pulleys for engine drive, or it can be mounted on a common base with an electric motor and driven by a flexible coupling.

Both Type PE and Type PB Fluidyne pumps are single stage, end suction, centrifugal design. Simplicity and quality and ruggedness are inherent in their design. All parts are easily accessible. Close attention to hydraulic characteristics has resulted in pumping units of high efficiency. Disassembly and assembly for inspection or maintenance is rapid.

Fluidyne pumps operate with unimpaired efficiency in any position—vertical, horizontal or intermediate angle. All parts of exacting Peerless manufacture found only in highest quality pumps. Evidence of their high quality is found in features such as high strength cast bronze streamflow impellers, replaceable bronze wear rings on pump case, oversize packing, drain pocket, ball bearings (PB unit), precision alloy steel shafts.

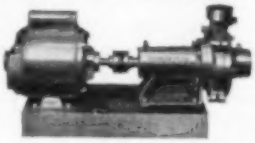
You can probably visualize a score of uses for these dependable, economical pumps. Write today for bulletins describing and illustrating Peerless Fluidyne pumps in the size and type you require.

FRACTIONAL HORSEPOWER CLOSE-COUPLED TYPE PE



⅛ to 1 h.p. • 3450 rpm • 60 cycle
Capacity: To 50 gpm • Heads: To 90 Ft.

DIRECT OR BELTED TYPE PB FRACTIONAL HP COMMON BASE



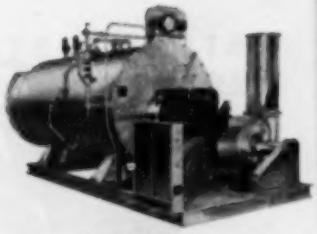
⅛ to 1 h.p. • 3450 rpm • 60 cycle
Capacity: To 50 gpm • Heads: To 90 Ft.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION

Factories: Los Angeles, California, and Indianapolis, Indiana
Offices: New York, Atlanta, Fresno, Los Angeles, Chicago, St. Louis, Phoenix, Dallas, Plainview and Lubbock, Texas.

Why divide responsibility for a process boiler?

Buy PREFERRED and Lower Steam Costs



THERE'S NO NEED to divide responsibility for a boiler between a half dozen different men. That kind of operation often wastes time, creates confusion, raises costs. That's why more and more engineers look to Preferred. They get *one* unit that's fully coordinated and equipped . . . *one* unit that's ready to generate steam economically.

What's more, they've found that Preferred Unit Steam Generators come through every test with flying colors.

COST OF OPERATION?—These units cut fuel bills as much as 40% . . . and they *keep* repair bills low.

FULLY AUTOMATIC? Yes,—Even with No. 6 oil, including the new catalytic residuals.

NEED AN EXPENSIVE UGLY STACK? *No*, only a simple vent to the outside is required.

COMPACT? Preferred units occupy about half the space needed by ordinary boilers of equivalent output. Headroom requirements are low—saves costly excavations. So you play safe when you specify a Preferred Unit Steam Generator. This factory-completed unit not only simplifies and expedites installation, but also gives you a trouble-free, economical source of steam.

Write for bulletin 1000. It contains complete engineering details of the Preferred Unit Steam Generator and shows you how you can lower your steam costs.

8 PREFERRED "WORTHMORE" FEATURES

- Preferred-built 4700 rpm Horizontal Rotary Oil Burner—assures fully automatic operation even with No. 6 oil.
- 4-pass, high velocity, gas travel—minimizes tube cleaning maintenance by self-cleaning action.
- Staggered tube construction—minimizes the possibility of tube pitting, even at low firing rates.
- Anti-stress deck for tube sheet protection.
- Self-cleaning *induced draft* fan with air cooled shaft and bearings—built to last 30 years.
- Down-draft gas travel for 80% thermal efficiency—proved and guaranteed.
- Special *precipitator* developed by Preferred as aid to safe and clean operation.
- Dual purging cycles for positive elimination of gas stratification.

PREFERRED UTILITIES MFG. CORP. • 1860 BROADWAY, NEW YORK 23, N. Y.

PREFERRED UTILITIES MFG. CORP.

Now . . . Buell SF ELECTRIC PRECIPITATOR

This announcement of the availability of a made-in-America "SF" Precipitator is NEWS of broad significance. With a Precipitator, also, Buell is in a position to provide any efficiency desired in the collection and recovery of fine and ultra-fine dusts.

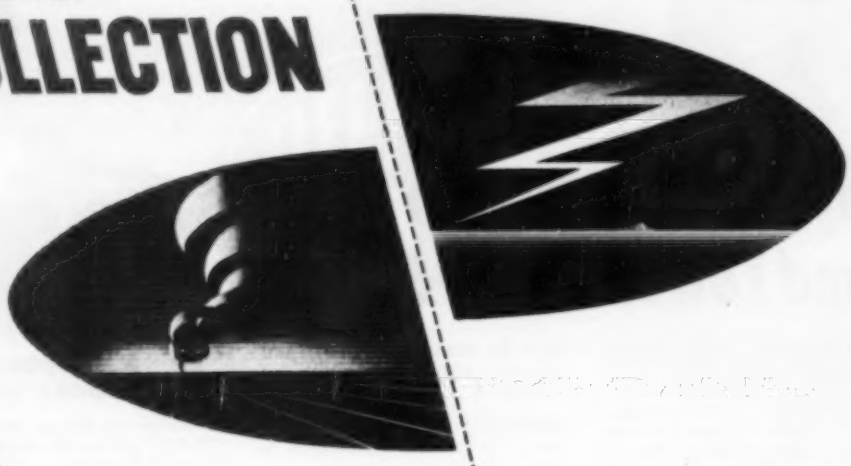
The Buell "SF" Electric Precipitator is made under license from Svenska Flaktfabriken, subsidiary of ASEA (Swedish General Electric Company). Through 18 years of engineering experience and more than 150 installations in 11 countries, the broadest range of operating conditions have been met. The "SF" Precipitator now takes up equivalent first line service in the Americas:

- in separating and collecting dusts of value suspended in process air or gases.
- in fly ash and nuisance dusts collection for general air pollution abatement.

Sizes and types of equipment are standardized to meet all needs.

The Buell Sales Engineering Staff invites opportunity to discuss specific problems. Write, wire or telephone.

World experience in both techniques of DUST COLLECTION



Buell van Tongeren CYCLONE

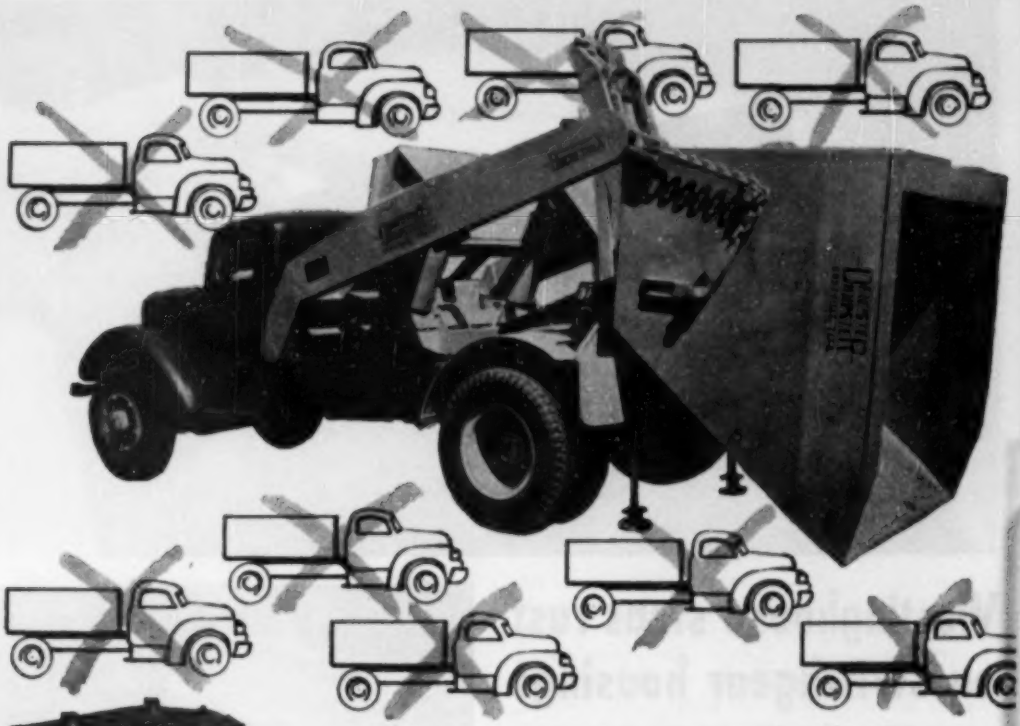
Scientific dust collection and the doing away with air pollution was just coming into its own in 1935, when Buell introduced to America the high-efficiency van Tongeren designs of AERODYNE.

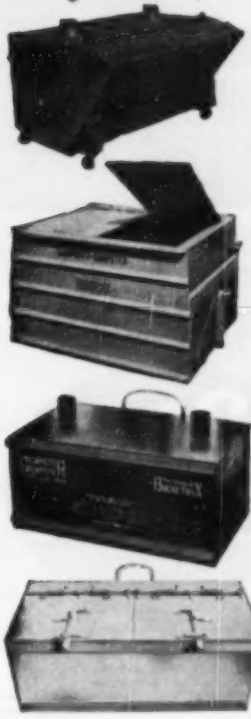
The Buell van Tongeren Cyclone pioneered in lifting centrifugal dust separation onto a new high plane. How solidly its patented van Tongeren Shave-off contributed to reaching otherwise unobtainable efficiencies is evidenced in the multi-industry use of this Buell System — and 15 year records of multiple re-orders.

For many, many conditions the Buell van Tongeren Cyclone is bound to be first preference, with fractional efficiencies, costs, operating simplicity and long-term reliability all taken into account. Catalog on request.

Buell ENGINEERING COMPANY

70 Pine Street, Suite 5040, New York 5, N. Y.





WOULD YOU WRITE A LETTER FOR FIFTY THOUSAND DOLLARS?

A simple reply to one of our advertisements . . . a meeting of probing minds over the problems involved . . . the replacing of ten conventional trucks with only one Dempster-Dumpster truck unit and 99 containers . . . fifty thousand dollars annual savings for this one firm.

That, briefly, was the result of a simple inquiry for information about the Dempster-Dumpster System of materials handling.

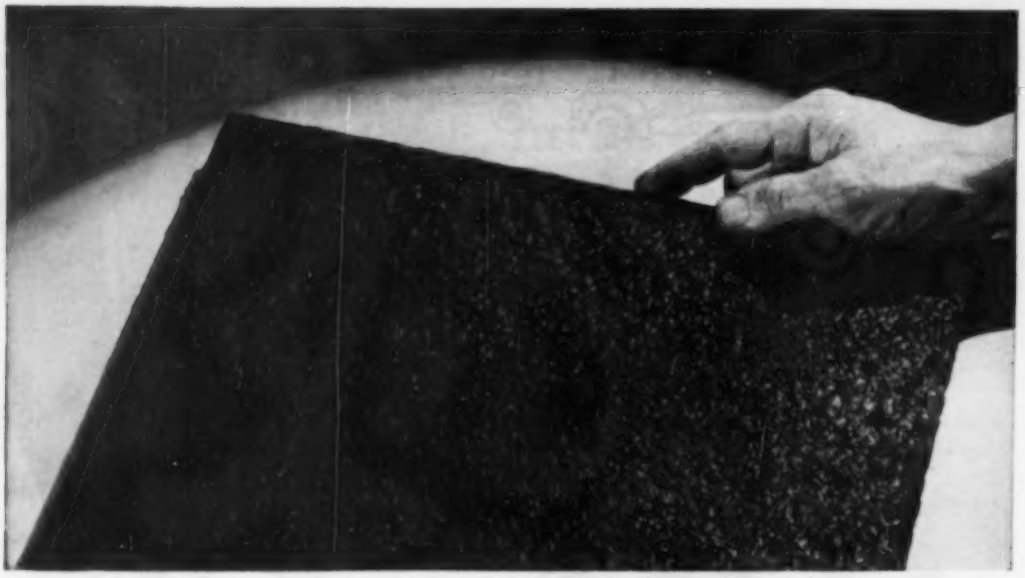
A comprehensive Dempster-Dumpster survey revealed costly delays, unnecessary handling of materials, and much time wasted by loading crews. All were eliminated to the tune of $50,000 savings annually. Fast pick-up, hauling and dumping of pre-loaded Dempster-Dumpster containers replaced the old method of plant hauling. Ninety-nine detachable containers, built in over 20 sizes and designs for the specific materials they handle, were spotted at material accumulation points. Some are handled by fork trucks, others by overhead cranes within plant buildings. As containers are filled, the Dempster-Dumpster truck hoisting unit and one man, the driver, picks up each container, hauls it to its destination, dumps it and returns the empty container for refilling.

Pick-up and dumping of these detachable containers takes less than 60 seconds. The entire operation works to an on-the-run schedule. One truck hoisting unit handling 99 containers and doing the work formerly requiring ten conventional trucks. Let us bring you the complete details of the Dempster-Dumpster System.

Containers, in standard and special types, in capacities from 1½ to 18 cu. yds. are available. Whatever your materials are, be they heavy, light, bulky, dust, liquid, waste, raw or finished, you'll find a Dempster-Dumpster container ready, or custom built, to do the job more efficiently.

DEMPSTER DUMPSTER SYSTEM

DEMPSTER BROTHERS, INC., 240 DEMPSTER BLDG., KNOXVILLE 17, TENNESSEE



Westinghouse stops rust on switchgear housings

All-weather 3M coating system protects metal against corrosion

Westinghouse outdoor switchgear housings need protection against rain, snow *and* abrasion from wind-blown sand and grit. Tough EC-1034 gives a rubberized coating that stays on the job in all kinds of weather—cold or hot.

You can solve *your* rust-prevention problems with one of the many 3M Coating Systems. There's one for every purpose. When you want to save money with a coating that's tailored to your needs, just remember the 3M name!

SPRAYING HEAVY COAT of EC-1034 on underside of switchgear cabinets at Westinghouse. Coating has excellent adhesion, forms a continuous, corrosion combatting film that won't sag—even at ⅛-inch thickness on a vertical surface.

OTHER TYPICAL PROTECTIVE COATINGS

EC-244—resists corrosion AND abrasion.

EC-539—Neoprene coating resists strong acids.

EC-968—vinyl coating protects polished metal in cold forming.

Cero-Gard—protects against sour crude oil, fresh and salt water.

WRITE TODAY for complete information on the various metal-coating systems. Address: Adhesives and Coatings Division, 411 Piquette Avenue, Detroit 2, Michigan. Experienced engineers will be glad to show you how to cut replacement costs with these carefully formulated coatings. No obligation.

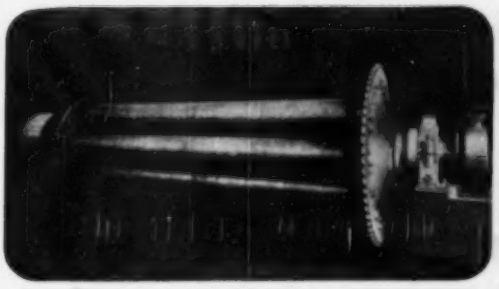
Made in U.S.A. by MINNESOTA MINING & MFG. CO.
ADHESIVES AND COATINGS DIVISION
411 Piquette Avenue, Detroit 2, Michigan
Also makers in St. Paul 6, Minn., of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotch-lite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives.

General Export: Durex Abrasives Corp., *New Rochelle, N. Y.* • *In Canada:* Canadian Durex Abrasives, Ltd., *Brantford, Ontario*

40 Years Experience Goes a Long Way Toward Assuring Profitable Kiln Operation

For over forty years Traylor has been building Rotary Kilns. *Every one was designed for a specific operation.* The refinements to be found in every Traylor Kiln are based on that bedrock of experience. More efficient, low-cost production of a higher quality product is the result.

Traylor Kilns have rigid shells of heavy steel plates . . . electrically welded into a single piece! All circumferential joints are reinforced by steel bands into which the welding penetrates. The discharge end is similarly strengthened with a heavy steel band. Riding rings are accurately turned and faced. Steel gears and pinions are precision cut. Improved supports of the most suitable type for each installation are selected from the many advanced Traylor designs.



Traylor Rotary Coolers share all of the structural advantages of Traylor Kilns. They are built in four types. Each is "tailor-made" for the most efficient cooling of your material by air, water or a combination of both. You can select from single or multiple tube types . . . direct or indirect.

SEND FOR FREE BOOKLET

Traylor equipment is profit building equipment! Write today for illustrated Bulletin 115 which describes Traylor Rotary Kilns, Coolers and Dryers in detail.

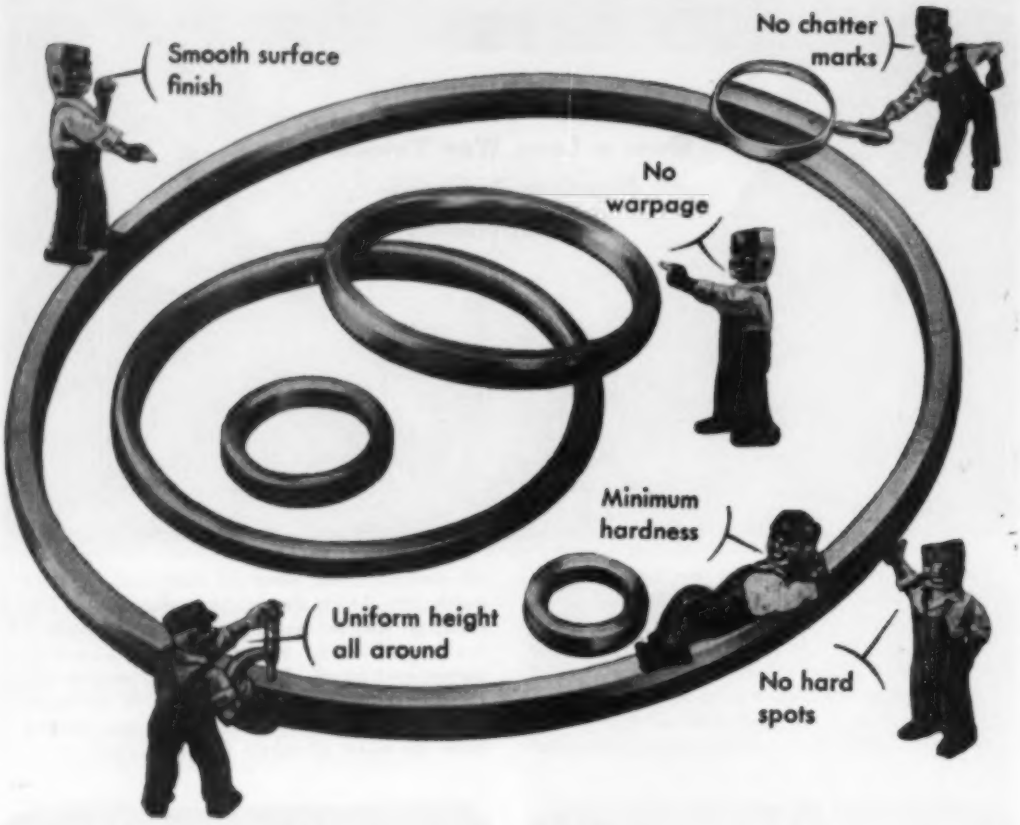
TRAYLOR ENGINEERING & MANUFACTURING CO.
135 Mill St., Allentown, Pa.

Sales Offices: New York, N. Y., Chicago, Ill., Los Angeles, Calif.
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

Traylor

Rotary Kilns, Coolers and Dryers
Grinding Mills . Crushing Rolls
Jaw, Reduction and Gyratory Crushers

A "TRAYLOR" LEADS TO GREATER PROFITS



Made "soft" for proper flow ... Made accurate for perfect fit!

Goetze V-Tite Gaskets for ring-type joint flanges

One sure way to tell quality in a gasket designed for ring-joint flanges is to check the hardness. In Goetze V-Tites, carefully controlled heat treatment during fabrication keeps hardness down to a minimum. The hardness of a Goetze soft iron V-Tite Gasket, for example, does not exceed 90 Brinell.

And because each gasket is uniformly "soft" throughout (you'll find no hard spots in a Goetze V-Tite), proper flow or seating of the gasket, without damage to flange surfaces and with minimum bolt stresses, is always assured.

Dimensional accuracy is also important in a ring-type gasket. Here, too, Goetze V-Tites meet high precision standards. They are of uniform height all around . . . free of warpage . . . have the same center-to-center measurements top and bottom . . . other tolerances are well within API and ASA specifications to assure a perfect fit in the flange grooves.

In addition to soft iron, Goetze V-Tite Gaskets are made in a number of alloys in all standard ASA and API shapes and sizes. Gaskets of special dimensions are also available. For further details, write for Catalog PK-35A. Johns-Manville, Box 290, New York 16, N. Y.

JM

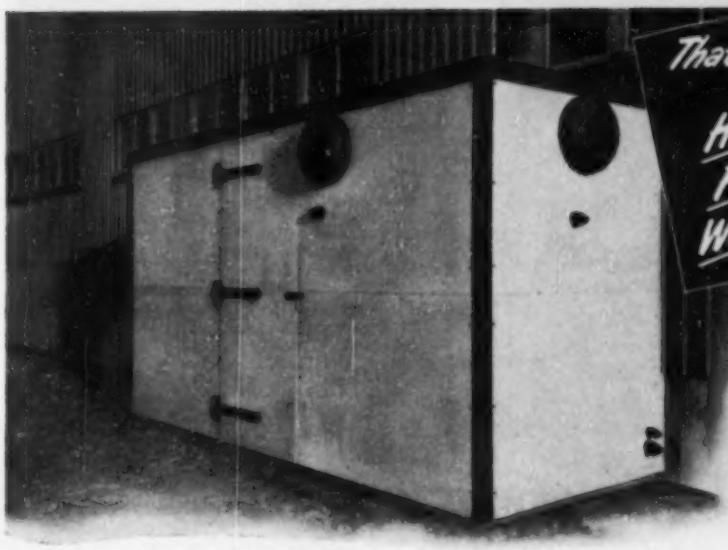
Johns-Manville Goetze Gaskets

THERE'S A JOHNS-MANVILLE PACKING OR GASKET FOR EVERY SERVICE

New!

KAYLO LAMINATED PANELS Provide Finished Walls

That Resist HEAT LOSS... FIRE... ROT... WATER DAMAGE



In this typical installation, Kaylo Laminated Panels (with cement-asbestos facing) are used on a valve house.

EASY TO ERECT

Kaylo Laminated Panels are easy to erect, lightweight (only 6 lbs. psf)—can be sawed, nailed or bored with standard tools.

FOR CURTAIN-WALLS OR INTERIOR PARTITIONS, new Kaylo Laminated Panels provide many big advantages to the chemical, refining and allied industries. Available with a number of different facings, Kaylo panels offer these important features:

Fire Protection—The Kaylo core is incombustible. Installed with proper joint systems, Kaylo Laminated Panels (with cement-asbestos, steel, aluminum or Monel facings) meet A.S.T.M. one-hour fire standards.

Insulating Value—Two-inch panels have better insulating value than 16 inches of solid concrete.

Permanence—The Kaylo core is an inorganic chemical composition which is rot-proof, vermin-proof and insoluble in water.

Structural Strength—Kaylo Laminated Panels have great strength and dimensional stability. Facing and core material are securely bonded with waterproof adhesives.

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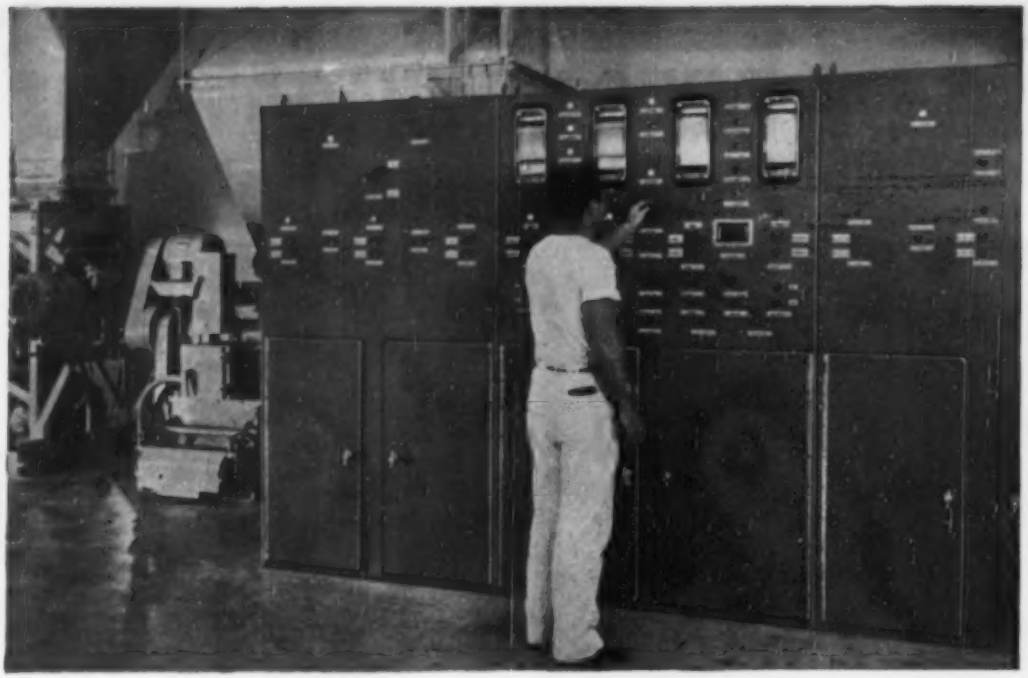

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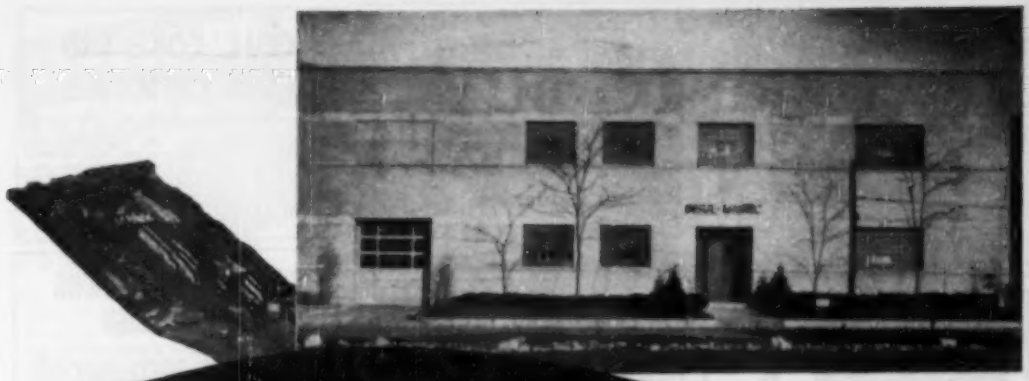

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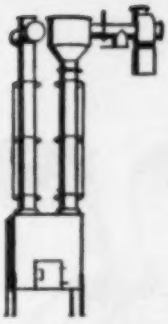

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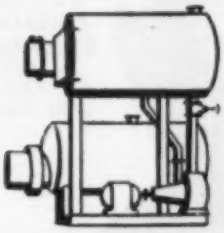

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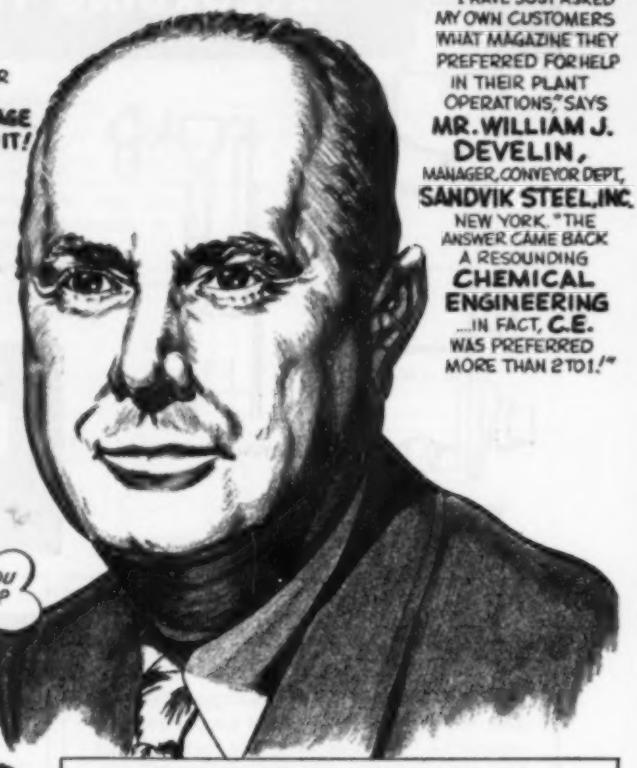

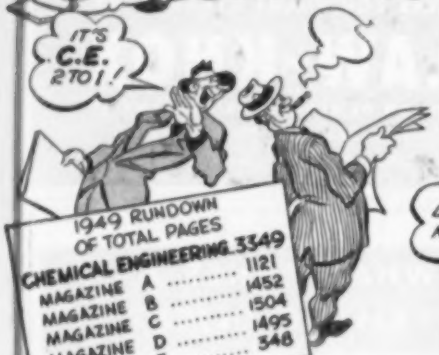

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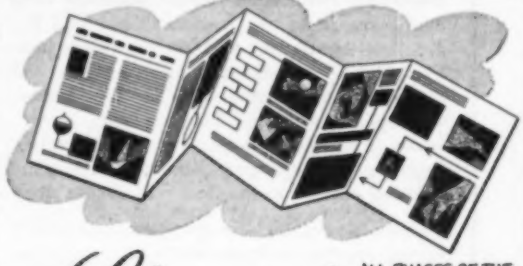

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ENGINEER-EXECUTIVE: 17 years experience in research, pilot-plant, production and sales in chemical industries. Age 38, married, children. Can offer superior chemical specialty product for the automotive trade. PW-1915, Chemical Engineering.

MECHANICAL ENGINEER—6 years, chemical plant layout, process piping, machine design and maintenance, 7 years diversified and supervisory experience. PW-1924, Chemical Engineering.

B.Ch. ENG. Cornell University. No experience, will accept anything reasonable in order to get started. PW-6189, Chemical Engineering.

CHEMICAL ENGINEER, B.S.Ch.E. 1949. Desire position as a trainee in a field with a future. Monetary remuneration of secondary importance. Will go to any part of the country. PW-6167, Chemical Engineering.

CHEMICAL ENGINEER, 29, graduate, PE. Eight years experience in layout, design, construction, operation and maintenance of vegetable oil and chemical plants. Desires permanent, responsible engineering position with small company. Midwest location preferred but not necessary. PW-2284, Chemical Engineering.

MECHANICAL ENGINEERING position desired in chemical industry as a process, maintenance or design engineer. Can assume supervisory work. Grad. M.E., age 24, 14 years varied exp. for both mfg. and eng. companies, with 7 years in chemical industry. Also specialized knowledge of piping and controls. Now supervisor on power plant construction. PW-6049, Chemical Engineering.

A METALLURGICAL engineer available 1950 B.S. M.E.T.E. Purdue, married, age 25. Veteran. Aluminum Fab. experience. Prefer production. Seek opportunity before salary. PW-6015, Chemical Engineering.

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INDUSTRIAL ENGINEER, seasoned plant manager available to manufacturer in need of skilled man to take over organization, development, and production. Excellent record of achievement in labor relations. Free to travel if necessary for multi-plant work.

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Civil Engineering graduate with minimum 12 years' experience in supervising project engineers on building work, waste disposal and structural design. Scheduling experience also desirable. Location in East with established chemical company. Furnish detailed resume of experience and education, also salary requirements, in reply.

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Sales representatives in all parts of U. S. A. and Canada to sell corrosion resisting cements, coatings and finishes for repairing, lining and sheathing mechanical and building equipment. Four years of research, laboratory and field testing have resulted in exciting new materials and technics. Excellent sales opportunities for men familiar with chemical corrosion. Write fully.

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100 gal.—500 gal.—1000 gal.—3000 gal.

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18" and 36"

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100 gal.—500 gal.

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2—Pfaudler Aluminum Jacketed Reactors, 250 and 1300 Gallons.
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1—Shriver 42"x42", Cast Iron, P & F Filter Press, 46 Chambers, with Hydraulic Closing Device.
2—Shriver 36"x36", Cast Iron, Closed Delivery Filter Press, 25 Chambers and 17 Chambers.
1—Sperry Aluminum Filter Press, 18"x18", Closed Delivery, 9 Chambers.
1—Sparkler SS Filter, Model 14-D-4.
3—Vallez Filters, #49 and #3.

1—Sperry Rubber Lined Filter Press, 12"x12", recessed type, closed delivery.
3—Shriver P & F Laboratory Filter Presses, 7"x7".
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1—Sperry 36"x36" Recessed Type Filter, center feed, open delivery, 43 Hercolite covered plates.
1—Aluminum Storage Tank—10,000 Gallons
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1—Patterson 5,000 Gallon Mixing Kettle (New)
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1—Stainless Steel Direct Fired Still, 6'x9', with coils and Agitator.
1—Blaw-Knox Jacketed Autoclave, 3'x4'2" with Agitator.
1—Patterson Jacketed Autoclave, 3'x3'9".
1—Buflovak Chrome Plated Double Drum Dryer 32"x80", complete with motor, speed reducer, and conveyor.
2—Buflovak Vacuum Drum Dryers, 24"x20".
3—Buflovak Vacuum Drum Dryers, 5'10"x10'.
1—Louisville Rotary Steam Tube Dryer, 54"x30'.
3—Louisville Rotary Steam Tube Dryers, 6'x30'.
2—Buffalo Double Door Vacuum Shelf Dryers, 12 & 14 Shelves.
3—Buffalo Flakers, 5'x12'.
2—Black & Clawson Double Drum Dryers, 28"x5'.
1—Louisville Rotary Laboratory Steam Tube Dryer, 12"x5", SS Lined.
1—Bartlett & Snow Direct Fired Kiln, 6½'x50'.
1—Ruggles Cole Direct Fired Kiln, 7'x60'.
1—Sanbury Mixer #1 with 50 HP motor.
4—Baker Perkins Jacketed Vacuum Type Double Arm Mixers, w/ motors and drives, 100 Gallons.
3—Cavagnarro Vacuum Type Double-arm Mixers w/motors and drives. 600# Capacity, Stainless Steel.

1—J. H. Day Double Arm Jacketed Mixer, sigma blades, 500 gals.
3—J. H. Day Double Arm Jacketed Mixers, 50 gals., sigma blades.
1—Baker Perkins double arm jacketed Mixer, 200 gals., sigma blades.
5—Baker Perkins double arm Mixers, 200 gals., sigma blades.
1—Patterson nickel lined Blender, 125 cu. ft. cap., w/30 HP Motor.
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1—Bird Suspended Type Centrifuge, 40" SS perforated basket with motor.
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1—Abbe Engineering Silex Linex Pebble Mill, 6'x13'.
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1—#9 Mikro Atomizer, Stainless Steel, w/20 HP Motor.
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1—Stainless Steel Column, 10"x18'.

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3—Shriver, Sperry, 24" x 24" C.I., P&F, 24, 25 and 36 chambers.
2—Sperry 30" x 30" bronze, P&F, 30 chambers.
2—Sperry 30", P&F, 24, 30 chambers, C.I.
1—Niagara #275 stainless, pressure type.
12—Shriver, Sperry Shoestone and wood P&F, 18" to 42".

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1—Williams "Titan" 5-roll High Side Mill.
1—Patterson 4' x 5' steel jacketed Ball Mill.
2—Rodgers 3' x 4' & 3' x 5' Pebble Mills.
1—Patterson 3' x 10' steel Tube Mill, m.d.
1—Hardinge 3' x 22" Conical Steel-lined Ball Mill with feeder, classifier and motor.
5—Mikro Pulverizers, 4TH, 2TH, 2DH, 1SH.
4—Ball & Jewell #1, #2 and #3½ Rotary Cutters.
2—Premier Colloid Mills 8", 4" dia., S.S.

SCREENS

6—Rotex, No-Ball #81 and #82 Single & Double Deck, Stainless Steel, with 40" x 120" screens.
4—No-Ball #41 Single Deck 40" x 120", 40" x 64".
6—Tyler Hummer 4' x 10', 4' x 5', 3' x 10'.

KETTLES

1—S.S. 7' x 8', agitated, with S.S. coil.
5—Stainless Steel Jacketed, Agitated Reactors, 2000, 150 & 100 gals.
4—Steel 2000 gal. steam jacketed, agitated.
1—Steel 250 gal. open top jacketed, agitated.
10—Stainless 20 to 300 gal., jacketed.

EVAPORATORS—TANKS

4—Stainless Vertical Tanks, 7'0" x 14', with side entering agitators.
2—Stainless Horizontal Tanks 6'0" x 14', with stainless coils.
2—Bullovak 6' dia. Crystallizers.
6—Copper Vac. Stills 75 to 500 gal.
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2—Evaporators, Calandria Type, 8'0" 7", all copper, with condensers, 1000 and 1100 sq. ft.

MIXERS—ALL TYPES

1—Banbury #00 Mixer with 10 HP motor & forced feed lubrication.
1—Baker Perkins Jacketed, Double Arm Vacuum.
4—Baker Perkins 100, 50 gal. Jacketed, Double Arm.
1—Baker Perkins 2-gal. stainless Double Arm.
1—Day #6 Cincinnatus, jacketed, Double Arm, 100 gal.
10—Day, Robinson, 100 to 2000 # Powder Mixers.
1—Groendler 5000 # Steel Powder Mixer.
1—Musen 62 cu. ft. steel Conical Blender.
25—Electric Portable Agitators, 1/4 HP to 5 HP.

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10—Ross Eng. 2-Truck Atmospheric Dryer, steam heated, 500 sq. ft. drying surface; has single units or multiples.
6—Bullovak 32" x 100", 18" x 30" Atmospheric Double Drum.
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6—Allis Chalmers Rotary Kilns 9'6" x 250', 7'6" x 125', 9' x 60'.
1—Bartlett & Snow 6' x 40' Rotary Kiln with 4' x 45'6" jacketed rotary cooler.
5—Ruggles-Coles 6' x 40' stainless Rotary Steam Tube Dryers.
6—Louisville 6' x 50', 6' x 20', 6½' x 35', 36" x 20' Rotary Steam Tube Dryers.
1—Devine #23 Double Door Vac. Shelf Dryer with 13—60" x 70" shelves.
3—Stokes, Devine Rotary Vac. Dryers, 18" x 42", 30" x 8', 5' x 25', 5' x 30'.

CENTRIFUGALS

2—AT&M 48" x 40" Suspended Type with stainless steel imperforate and perforated baskets, bottom discharge, m.d.
1—AT&M 40" Suspended, monel perforated basket.
1—Fletcher 40" Suspended, steel imperforate basket.
1—Tolhurst 40" Suspended, rubber perforated basket.
1—Tolhurst 32" Suspended, monel perforated basket.
1—AT&M 20" Suspended, stainless imperforate basket.
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1—Bird 16" x 20" monel, solid bowl, continuous.
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1—Knapp #429 Carton Sealer with Compression Unit.
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44	150	5x5	INGERSOLL ERI
69	134	6x6	IR-CPT
88	60	7x5	INGERSOLL ERI
93	100	7x6	AM-CPT-IR
120	70	8x6	IR-PA
136	125	8x8	CPT-IR
173	100	9x8	IR-CPT-SULLIVAN
233	70	10x8	IR-PA
294	125	10x10	IR-CPT
336	40	12x8	IR-CPT
368	100	12x10	IR-CPT-PA
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526	100	14x12	IR-CPT-GD
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1—ROTARY VACUUM DRYER, 5' x 33'.
1—6' x 12' ALLIS CHALMERS ROD MILL.

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3—30" x 30" Aluminum Plate and Frame Filter Presses, two Shriver and one Sparry—48 chambers each, side feed, open delivery, used on pectin. In excellent condition and for immediate shipment.

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1—6' x 12' OLIVER ACID-PROOF FILTER, lead fitted.

RUBBER COVERED SHRIVER FILTER PRESSES

5—36" x 36" Shriver Filter Presses, each 4-eyed, closed delivery, top feed, 11" c/c of legs, 6'6½" chamber space, complete with side bars, 50-Ton "Seco" closing device, semi-hard rubber plates and rubber covered C.I. frames. One press has 13'6½" chamber space.

SIMPSON INTENSIVE MIXERS

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2758/R17—6' Steel Bubble Cap Columns with 4000 Gal. 8000 Pot and Condensers.
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2756—Alberger Karbate Hydrochloric Acid Recovery System.
2756/R12—Four Steel Chlorinators; 1000 Gal.; 6' x 16'.
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2034—Stokes Copper Water Stills 50 to 100 Gal. per hour.

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2032—Stokes Lab. Vac. Shelf Dryer; 12" x 12" x 18".
2034/C1—Devine Vac. Shelf Dryer; 40" x 68" x 22".
2570/A5—Two Devine Vacuum Chambers No. 11; 40" x 50" x 68".
2330/S6—Bartlett & Snow Stainless Pan Dryer; 7'10½" x 2'11" with accessories.
2400—Stokes 3' x 5' Nickel Rotating Jacketed Vac. Dryer.

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2758/R1—Six Butt Welded Steel Horizontal 10,000 Gal. Pressure Tanks 8' x 30'; ¼" thick shell.
2604—Two Steel Storage Tanks; 4700 Gal. Horizontal; 79" x 23'0" made of ¼" plate; with coils.

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2385—Raymond Model "00" Pulverizer.
1400—Two Raymond No. 45 Imp Mills with separators and blowers.
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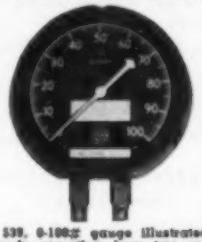

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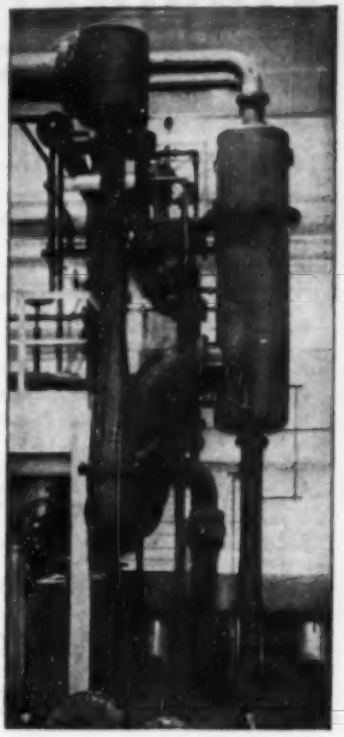

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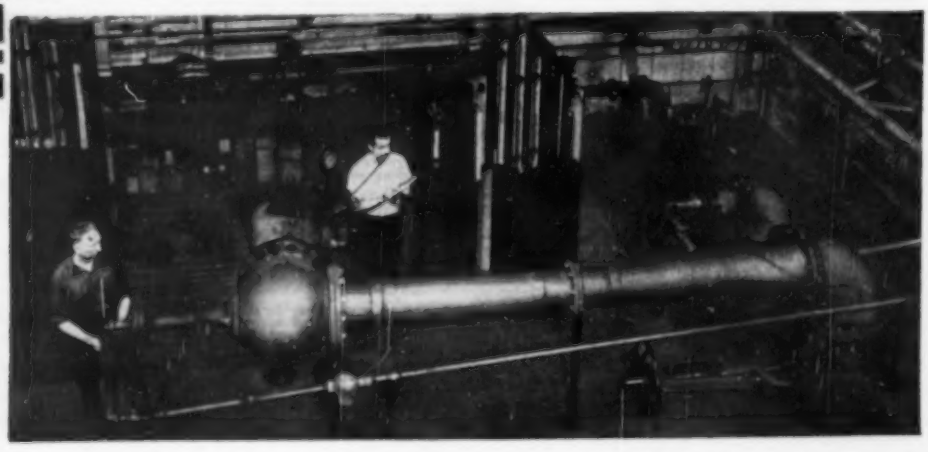

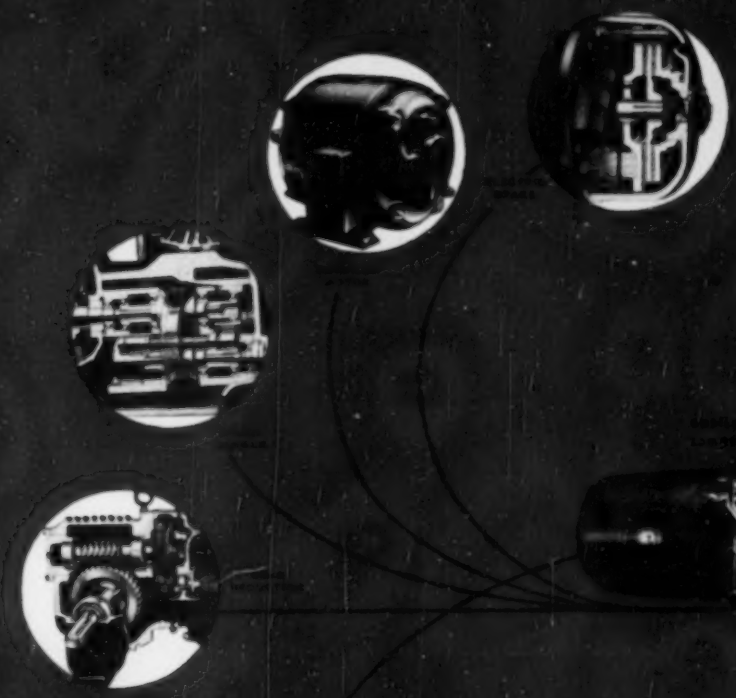

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